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Natural Resources Conservation Service

In cooperation with Purdue University Agricultural Experiment Station and Indiana Department of Natural Resources, Division of Soil Conservation and State Soil Conservation Board

Soil Survey of Elkhart County, Indiana

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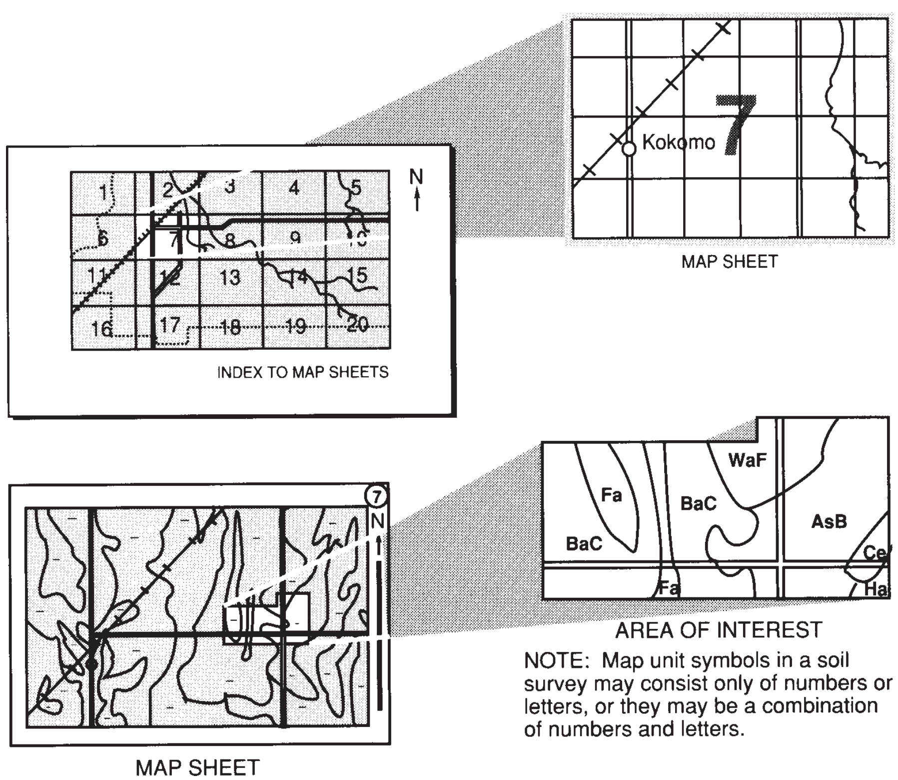
How To Use This Soil Survey

The detailed soil maps in this survey can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**. Note the number of the map sheet and turn to that sheet.

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Contents**, which lists the map units by symbol and name and shows the page where each map unit is described.

The **Contents** shows which table has data on a specific land use for each detailed soil map unit. Also see the **Contents** for sections of this publication that may address your specific needs.



This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1995. Soil names and descriptions were approved in 1997. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1995. This survey was made cooperatively by the Natural Resources Conservation Service and the Purdue University Agricultural Experiment Station. It is part of the technical assistance furnished to the Elkhart County Soil and Water Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: A center-pivot irrigation system in an area of Bainter sandy loam, 0 to 1 percent slopes. The urban development in the foreground represents a common land use in Elkhart County.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service homepage on the World Wide Web. The address is http://www.nrcs.usda.gov.

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Foreword

This soil survey contains information that affects land use planning in this survey area. It contains predictions of soil behavior for selected land uses. The survey also highlights soil limitations, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described, and information on specific uses is given. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

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Soil Survey of Elkhart County, Indiana

By Indiana Headwaters MLRA Soils Team, Natural Resources Conservation Service

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United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with
the Purdue University Agricultural Experiment Station

Elkhart County is in north-central Indiana (fig. 1). It has a total area of 299,635 acres, or 468 square miles. Goshen is the county seat. The survey area is part of Major Land Resource Areas (MLRAs) 98 and 111 (USDA, 1981). The climate provides ample precipitation and favorable temperatures for farming. The physiography consists of nearly level and gently sloping outwash plains in the northern part of the county, nearly level to moderately sloping outwash terraces and outwash plains in the northern and central parts, and nearly level to strongly sloping till plains in the eastern and western parts. The county is drained mainly by the Elkhart and St. Joseph Rivers.

Manufacturing and farming are important sources of income in Elkhart County. The diversified industrial enterprises provide full-time employment for many residents of the county and surrounding counties. Corn and soybeans are the main crops grown. Edible beans, fruits, seed corn, hay, vegetables, and nursery crops also are important. Poultry, hogs, beef cattle, and dairy cattle are the main varieties of livestock.

This soil survey updates the surveys of Elkhart County published in 1974 and 1914 (Kirchner and McCarter, 1974; Jones and Hesler, 1914). It provides additional information and has larger maps, which show the soils in greater detail.

General Nature of the County

This section provides general information about Elkhart County. It describes history and settlement; physiography, relief, and drainage; climate; farming; water resources; transportation facilities; schools; recreation; manufacturing and agricultural business services; and trends in population and land use.

History and Settlement

The first settlers moved into the county in about 1828. They came from Ohio, Pennsylvania, and New England and settled near the present town of Elkhart. The Miami and Potawatomi Indians previously occupied the region, but they had moved west of the Mississippi River by 1838. The county was organized in 1830 and was named for the popular trail stop at a small island at the confluence of the St. Joseph and Elkhart Rivers. This island, to an early Indian, seemed to be in the shape of an elk’s heart, and so the area was known to the Indians as “Elk Heart.”

Physiography, Relief, and Drainage

Elkhart County is mainly in the St. Joseph drainage basin, the mouth of which is at St. Joseph, Michigan. This basin drains into Lake Michigan and subsequently into the Atlantic Ocean. A very small area in the southwestern part of the county is in the Kankakee River drainage basin, which drains into the Mississippi River.

The 573-square-mile area drained by the Elkhart River, upstream from Goshen, includes about 120 square miles in southeastern Elkhart County. Many abandoned meanders occur in the Elkhart River Valley. Solomon Creek is a small stream that has a wide

Figure 1.—Location of Elkhart County in Indiana.

valley. Haphazard drainage patterns mark moraine areas in the county, and local watershed divides occur near the crests of the moraines.

There are several lakes in the county, and most of them are shallow. Gauging stations are located on Heaton, Hunter, Indiana, Simonton, and Wolf Lakes. Stream gauging stations are located on the St. Joseph River at Elkhart, on Christiana Creek at Elkhart, and on the Elkhart River at Goshen.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Goshen College in the period 1961 to 1990. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on the length of the growing season.

In winter, the average temperature is 25.9 degrees F and the average daily minimum temperature is 18.5 degrees. The lowest temperature on record, which occurred at Goshen College on January 21, 1984, was -24 degrees. In summer, the average temperature is 71 degrees and the average daily maximum temperature is 82 degrees. The highest temperature on record, which occurred at Goshen College on June 25, 1988, was 102 degrees.

Growing degree days are shown in table 1. They are equivalent to “heat units.” During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The average annual total precipitation is about 35.27 inches. Of this total, about 20.4 inches, or 58 percent, usually falls in May through October. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 5.7 inches on July 26, 1981. Thunderstorms occur on about 42 days each year, and most occur between April and September.

The average seasonal snowfall is 38.4 inches. The greatest snow depth at any one time during the period of record was 28 inches recorded on January 27, 1978. On an average, 54 days per year have at least 1 inch of snow on the ground. The heaviest 1-day snowfall on record was 14 inches recorded on January 26, 1978.

The average relative humidity in midafternoon is about 62 percent. Humidity is higher at night, and the average at dawn is about 82 percent. The sun shines about 73 percent of the time possible in summer and 44 percent in winter. The prevailing wind is from the west or southwest. Average windspeed is highest, between 11 and 12 miles per hour, from December to April.

Farming

In 1994, Elkhart County ranked first among Indiana counties in the production of cattle, calves, and milk cows and first in milk production (Gann and Liles, 1995).

In 1982, there were 213,225 acres of farmland and 1,678 farms. By 1992, however, the number of acres had dropped to 192,311 and the number of farms had dropped to 1,447. The average farm size was 127 acres in 1982 and 133 acres in 1992.

Corn, soybeans, and hay were the crops grown on the largest acreages in the county in 1995.

Water Resources

Prepared by Robert Watkins, manager, Environmental Health Service, Elkhart County Department of Health

The principal surface-water feature in the northern part of Elkhart County is the St. Joseph River. This river enters the county from Michigan in the northeastern part of the county, near Bristol. It then flows west across the county and through Elkhart into St. Joseph County. The county is divided by the Elkhart River, which enters at the southeast corner of the county and flows to the northwest to Elkhart, where it joins the St. Joseph River. The two major lakes in the county are Simonton and Heaton Lakes. Both are at the northern edge of the county and north of the St. Joseph River.

The St. Joseph River basin presents one of the most complex geological settings in Indiana resulting from the impact of three major ice lobes, a thick mass of glacial materials, and an irregular bedrock surface. Because of this complexity, the delineation of distinct aquifers may not be possible in some areas. Seven regional aquifer systems are identified within the river basin based on similarities in geological environments. Four aquifer systems have been identified in Elkhart County. These are the Nappanee, the St. Joseph, the Howe, and the Natural Lakes and Moraines aquifer systems. In very general terms, however, the county can be divided into two regions—an upland area to the south and a river valley area to the north. The thick glacial till of the upland area over the deep aquifer system provides aquifer protection because of the low permeability of the glacial till.

Sandy and loamy soils and shallow aquifers are dominant in the north and the river valley area. Because the soils are highly permeable and the water table is at or near the surface in many areas, this region is highly susceptible to ground-water contamination.

Most of the county's population and manufacturing is in the river valley area. Because of existing ground-water contamination and the potential for additional contamination, the St. Joseph aquifer system in the northern and northeastern parts of the county and extending toward the southwest to the county line and into St. Joseph County has been designated a "Sole Source Aquifer." To receive this Federal designation under the Safe Drinking Water Act, the aquifer must supply at least 50 percent of the drinking water in an area with no alternative supply available in comparable quantity or quality.

The bedrock underlying Elkhart County is of Devonian and Mississippian age. Most wells in the county are screened in glacial materials well above the bedrock. The aquifers provide one of the most abundant water supplies in Indiana. Withdrawals of 200 to 500 gallons per minute are common. Continuous well yields of 500 to 1,500 gallons per minute are common in areas where sand and gravel deposits are thick. In contrast, the presence of thick localized clay deposits in the southern part of the county may make a sufficient domestic supply of 10 gallons per minute difficult to obtain.

Regionally, the direction of the flow of ground water generally follows the topography and ultimately is toward the St. Joseph River and its major tributaries.

Transportation Facilities

There are 216 miles of highways in Elkhart County, including 21 miles of the Indiana Toll Road, 91 miles of Federal highways, and 104 miles of Indiana highways. There are approximately 1,340 miles of county roads in Elkhart County, and most of these roads are paved. The major highways crisscross the county so that all parts of the county are accessible.

Three airports serve small private planes and small corporate jet aircraft.

Four main railroad lines serve the county with approximately 60 miles of track. Amtrak offers the only rail passenger service from Elkhart County. The Robert R. Young Memorial Railroad Yard is a major freight yard that provides a rail route for westbound freight shipments from the East through Chicago and serves points in northern and central Indiana.

Schools

Prepared by Nancy Brown, education coordinator, Elkhart County Soil and Water Conservation District

There are seven public school systems in Elkhart County. According to official enrollment figures, more than 31,300 students attended public schools in Elkhart County in 1996-1997. In order by size, these schools are Elkhart Community Schools, Goshen Community Schools, Concord Community Schools, Middlebury Community Schools, Wa-Nee Community Schools, Fairfield Community Schools, and Baugo Community Schools. The Elkhart Community School Corporation has two high schools. All other corporations in the county have one high school.

Population and development trends have been on the increase throughout the county. Each public school system is addressing ways to increase the capacity of

their facilities to accommodate more students. There are also several private schools in the county that provide educational services for kindergarten through twelfth grade.

There are several colleges, universities, and technical schools in Elkhart County. Goshen College is a private college located in Goshen. Ivy Tech has a campus in Elkhart, and Indiana University, Purdue University, and Vincennes University all have extension centers in Elkhart as part of the Lifetime Learning Center. The Associated Mennonite Biblical Seminary and Elkhart Beauty College also are in Elkhart.

Recreation

Prepared by Nancy Brown, education coordinator, Elkhart County Soil and Water Conservation District

Elkhart County offers many public recreational opportunities. Many local parks have tennis courts and areas for playing baseball, volleyball, soccer, and other sports. The Elkhart County Park and Recreation Department maintains nearly 1,500 acres of county parks. Many of these parks are located along the Elkhart River. They offer fishing, boating, and canoeing facilities as well as picnic areas, hiking areas, cross-country skiing trails, and nature trails. The County Park System also includes an operating grist mill and historical museum.

Both Goshen and Elkhart manage over 200 acres of city parks with bicycle paths, picnic areas, playgrounds, and other recreational areas (fig. 2). Nappanee, New Paris, Middlebury, and Millersburg also maintain parks for recreational use. The city of Elkhart operates the Elkhart Environmental Center. The private Woodlawn Nature Center also is in Elkhart. There are 13 public and private golf courses in Elkhart County and numerous commercial camping facilities.

Recreational uses of private land throughout the county include camping, hunting, fishing, boating, and swimming; off-road vehicle trails, horseback riding trails, cross-country skiing trails, and snowmobile trails; and hiking paths.

Manufacturing and Agricultural Business Services

Elkhart County is known as the capital of the recreational vehicle (RV) industry. Goshen and Elkhart have many different industries, many of which are related to the RV industry. A large pharmaceutical company is located in Elkhart. Band instruments are also manufactured in Elkhart. These industries employ part of the labor force of the county.

Grain is marketed through local elevators. Some corn is processed locally in feed mills for animal feed. The New Energy Corporation, which produces alcohol from corn, provides a major market for corn in the area. The remainder of the corn is exported. Soybeans are shipped to processing plants in Decatur and in Logansport, Indiana.

Milk from the numerous dairy farms is processed at Goshen and New Paris. Cheese is produced at Middlebury.

Shipshewana, Topeka, and Waterways are the major livestock markets for cattle, hogs, and horses. Goshen and Warsaw are the major markets for poultry.

Trends in Population and Land Use

According to census data, Elkhart County had a population of 156,198 in 1990. This number reflects a population density of about 334 people per square mile. The population increased by 13.7 percent between 1980 and 1990 (U.S. Department of Commerce, 1984).

During the period from 1982 to 1987, the extent of urbanized land increased by about 4 percent and the extent of all categories of agricultural land decreased by the same amount. In 1987, about 68 percent of the county remained in agricultural use. Approximately 1,740 acres of land is being converted to urban uses each year. This trend is expected to continue at the same rate for several years.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the

Figure 2.—A playground in an area of Waterford loam, 0 to 2 percent slopes, frequently flooded, long duration.

geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the

same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analysis and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

The descriptions, names, and delineations of the soils in this survey area do not fully agree with those of the soils in adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey areas.

Formation and Classification of the Soils

This section describes the factors of soil formation and relates the processes of soil formation to the soils in the survey area. It also describes the system of soil classification used by the Natural Resources Conservation Service.

Factors of Soil Formation

Soils form through physical and chemical weathering of geologic materials. The characteristics of a soil at any given point are determined by the physical and mineralogical composition of the parent material; the climate under which the soil material was deposited and has existed since deposition; the plant and animal life associated with the soil; the relief, or lay of the land; and the length of time that the forces of soil formation have acted on the soil material.

Climate and plant and animal life are active factors of soil formation. These factors act on the parent material that has accumulated through the weathering of rock and slowly change it into a natural body that has genetically related horizons. The effects of climate and plant and animal life are influenced by relief. The weather patterns in Elkhart County do not change significantly; therefore, plants are the major active factor of soil formation. The parent material affects the kind of soil profile that forms. Finally, time is needed for the transformation of the parent material into a soil. Some time is always required for the differentiation of soil horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effects of any one factor unless conditions are specified for the other four.

Parent Material

Parent material is the geologic mass in which a soil forms. It can be consolidated, such as bedrock, or it can be unconsolidated, such as glacial materials, recent alluvium, windblown materials, or lakebed deposits. In Elkhart County, the parent materials are unconsolidated and were deposited by continental glaciers and by meltwater from those glaciers. The parent materials are glacial till, glacial outwash, lacustrine deposits (lakebed materials), recent alluvium, and some windblown materials. Thick deposits of organic material also occur. Bedrock is a few hundred feet below the surface. Parent material determines the limits of the chemical and mineralogical composition of the soil. Some of these materials were reworked and redeposited by the subsequent actions of water and wind. Some authorities believe that the most recent glaciers covered the county about 15,000 years ago and finally retreated about 12,000 years ago. Although the parent materials are of similar glacial origin, their properties vary greatly, sometimes within small areas, depending on how the materials were deposited.

Glacial till is material deposited directly by glaciers with little or no water action. It consists of particles of different sizes that are mixed together. The small pebbles in glacial till have sharp corners, indicating that they have not been worn by moving water. The glacial till in Elkhart County is mainly from the Huron-Saginaw lobe. A small portion is from the Erie lobe. This glacial till is calcareous, has a variety of densities, and is sandy loam, loam, or clay loam. Crosier soils formed in firm, loamy glacial till. These soils typically are medium textured and have well developed structure.

Glacial outwash material was deposited by moving water from melting glaciers. The size of the particles that make up glacial outwash varies, depending on the velocity of the water that carried the material. Rapidly moving water deposited particles that were heavy enough to fall out of the current, such as boulders, cobbles, or gravel. Water that moved more slowly deposited materials smaller in size. Clay, silt, and very fine sand were washed downstream. Outwash deposits generally occur as layers of similar-sized particles, such as sandy loam, sand, gravel, and other coarse particles, depending on the weather during the glacial melting. The warmer the weather, the more melting occurred and the faster the water was moving;

therefore, the larger materials were deposited. The cooler the weather, the less melting occurred and the slower the water was moving; therefore, the smaller materials were deposited. Bristol soils formed in glacial outwash material.

Lacustrine material was deposited by still, ponded, or very slowly moving glacial meltwater. Lacustrine materials are finer particles, such as very fine sand, silt, and clay, that settle in still water. Lacustrine deposits are silty or clayey. Lacustrine deposits are generally low and flat on the landscape, but some lacustrine deposits formed on the top of glaciers. Water accumulated in the low areas on top of the glacier and captured the materials blowing over the top of the glacier. When the glacier melted, these deposits settled as hills on the landscape. The soils in Elkhart County that formed in these deposits are medium textured or fine textured. Del Rey soils are examples.

Recent alluvium was deposited by floodwater along presentday streams. This material varies in texture, depending on the speed of the water from which it was deposited. Abscota and Waterford soils formed in recent alluvium.

Organic material occurs as deposits of plant remains. After the glaciers melted, water was ponded in depressions or in kettle lakes on outwash plains, lake plains, and till plains. Grasses and sedges growing around the edges of these lakes eventually died, and their remains accumulated in the depressions. As a result of the wetness and the subsequent lack of oxygen, the plant remains decomposed very slowly to an unrecognizable material, called muck. As the ponded areas evolved, water-tolerant trees grew and died. They deposited their remains in the water and thus added to the accumulation. The ponded areas were eventually filled with organic material. Houghton soils formed in thick organic material.

Climate

Climate helps to determine the kind of plant and animal life on and in the soil, the amount of water available for the weathering of minerals, the translocation of soil material, and the rate of chemical reaction in the soil. These influences are important, but they affect large areas rather than relatively small areas, such as a county.

The climate in Elkhart County is cold in winter and hot and humid in summer. It is presumably similar to the climate under which the soils formed. The soils in the county differ from soils that formed under a dry, warm climate and from those that formed under a hot, moist climate. The climate is uniform throughout the county. There are no major differences among the soils resulting from any differences in climate.

Plant and Animal Life

Plants have been the principal organisms influencing the soils in Elkhart County. Bacteria, fungi, soil micro-organisms, and earthworms also have affected the formation of the soils. The chief contribution of plant and animal life to soil formation is the addition of organic matter and nitrogen to the soil. The kind of organic material on and in the soil depends on the kinds of native plants that grew on the soil. The remains of these plants accumulated on the surface, decayed, and eventually became soil organic matter. The roots of the plants provided channels for the downward movement of water through the soil and added organic matter as they decayed. Bacteria and soil micro-organisms helped to break down the organic matter into plant nutrients.

The native vegetation in Elkhart County was mainly deciduous trees, but a few areas supported prairie grasses. Differences in natural soil drainage and variations in the kind of parent material affected the composition of the vegetative cover. Some well drained glacial outwash soils, such as Volinia soils, formed under prairie grasses. Other well drained upland soils, such as Riddles soils, mainly supported a variety of oak, walnut, and hickory. The somewhat excessively drained Coloma soils supported white oak and black oak. Wet soils, such as Brookston and Sebewa soils, primarily supported pin oak, black willow, cottonwood, and sycamore. The well drained soils that formed dominantly under forest vegetation generally have less organic matter and are more leached than the well drained soils that formed dominantly under prairie grasses.

Relief

Relief, or topography, has had a marked effect on the soils in Elkhart County through its influence on natural soil drainage, runoff, erosion, plant cover, and soil temperature. Slopes in the county range from nearly level to very steep. Runoff is the most rapid on the steeper slopes. Water is temporarily ponded in the lower areas.

Natural soil drainage classes in the county range from excessively drained on sandy ridgetops to very poorly drained in depressions filled with organic materials. Through its effect on soil aeration, drainage

determines the color of the soil. Water and air move freely through well drained soils but very slowly through very poorly drained soils. In well aerated soils, the iron compounds that give soils their color are brightly colored and oxidized. The excessively drained Coloma soils are examples of well aerated soils.

Very poorly drained soils are dull gray because the iron has been reduced and leached, leaving the soil with the natural mineral color. Gilford mucky sandy loam is an example of a poorly aerated soil.

Soils with intermediate drainage are poorly drained, somewhat poorly drained, moderately well drained, and well drained. The depth to the water table and the depth to reduced gray colors vary in these soils. Well drained soils do not have a water table within a depth of 40 inches.

Time

Time, usually a very long time, is required for the processes of soil formation to result in the formation of distinct horizons. Differences in the length of time that the parent material has been in place and the amount of disturbance, such as erosion or deposition, are commonly reflected in the degree of profile development.

The soils in Elkhart County range from recently deposited, such as soils on flood plains, to approximately 15,000 years old, such as soils on uplands. The glacial deposits in which many of the soils formed have been exposed to the soil-forming processes long enough for the development of distinct horizons. Soils that formed along flood plains are very young because new material is being deposited frequently, and the soil-forming process starts again with each disturbance.

Processes of Soil Formation

Several processes have been involved in the formation of the soils in Elkhart County. These processes are additions, such as organic matter; losses or dissolution, transfer, and removal of compounds, such as calcium carbonate and bases; liberation and translocation of silicate clay minerals; and transformation, such as reduction and transfer of iron or weathering of silicate clays. In most soils, more than one of these processes have helped to differentiate horizons (Ruhe, 1956; Stevenson, 1982).

Some organic matter has accumulated in the surface layer of all of the soils in the county. The content of organic matter ranges from very low to very high in the soils in Elkhart County, but it is moderate in most of the soils. Generally, the soils that have the most organic matter, such as Gilford and Houghton soils, have a thick, dark surface soil and are very poorly drained (Simonson, 1959).

Carbonates and bases have been leached from the upper horizons of nearly all of the soils in Elkhart County. Leaching of carbonates and salts preceded the translocation of silicate clay minerals. Most of the carbonates and the salts have been leached from the A and B horizons of well drained soils. Even in the wet soils, some leaching is indicated by the absence of carbonates and by an acid reaction. Leaching of wet soils is slower because of a high water table or the slow movement of water through the profile (Simonson, 1959).

Clay accumulates in pores and on the faces of structural units along which water moves. The leaching of bases and the subsequent translocation of silicate clays are among the more important processes of horizon differentiation in the county. Miami soils are examples of soils in which translocated silicate clay has accumulated in the Bt horizon.

Gleying, or the reduction and transfer of iron, has occurred in all of the very poorly drained to moderately well drained soils. In these naturally wet soils, this process has significantly affected horizon differentiation. A gray color in the subsoil indicates the reduction and redistribution of an iron oxide. Reduction is commonly accompanied by a transfer of the iron, either from upper horizons to lower horizons, or by the removal of the iron from the soil profile. Mottles (now referred to as redoximorphic features), which are in soil horizons that have been reduced, indicate the segregation of iron oxide (Birkeland, 1974; Birkeland, 1984; Buol and others, 1980; Franzmeier, 1997; Jenny, 1941).

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1996 and 1999). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 4 shows the classification of the soils in the survey area. The extent of the soils is shown in table 5.

The categories of soil classification are defined in the following paragraphs.

ORDER. Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalf (*Ud*, meaning humid, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludalfs (*Hapl*, meaning minimal horizonation, plus *udalf*, the suborder of the Alfisols that has a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective Typic identifies the subgroup that typifies the great group. An example is Typic Hapludalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineralogy class, cation-exchange activity class, soil temperature regime, soil depth, and reaction class. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed, mesic Typic Hapludalfs.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Detailed Soil Map Units

In this section, arranged in alphabetical order, each soil series recognized in the survey area is described. Each series description is followed by descriptions of the associated detailed soil map units.

Characteristics of the soil and the material in which it formed are identified for each soil series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the “Soil Survey Manual” (Soil Survey Division Staff, 1993). Many of the technical terms used in the descriptions are defined in “Keys to Soil Taxonomy” (Soil Survey Staff, 1996). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units on the detailed soil maps in this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information about each map unit is given under the heading “Use and Management of the Soils.”

A map unit delineation on the detailed soil maps represents an area on the landscape and consists of one or more soils or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some “included” areas that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar soils. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar soils. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying layers, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying layers. They also can

differ in slope, stoniness, frequency of flooding, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Bristol loamy sand, 10 to 18 percent slopes, eroded, is a phase of the Bristol series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are called complexes. A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Riddles-Oshtemo complex, 0 to 1 percent slopes, is an example.

This survey includes miscellaneous areas. Such areas have little or no soil material and support little or no vegetation. Pits, gravel, is an example. Miscellaneous areas are not members of a soil series, but the descriptions are in alphabetical order in this section.

Table 5 gives the acreage and proportionate extent of each map unit. Other tables (see Contents) give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

Abscota Series

Taxonomic classification: Mixed, mesic Oxyaquic Udipsamments

Typical Pedon for the Series

Abscota loamy sand, on a convex slope of 2 percent, in a wooded area on a flood plain, 1,600 feet south and 2,500 feet east of the northwest corner of sec. 12, T. 5 N., R. 12 W.; Kent County, Michigan:

A—0 to 5 inches; very dark grayish brown (10YR 3/2) loamy sand, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; many roots; slightly acid; abrupt wavy boundary.

Bw1—5 to 11 inches; yellowish brown (10YR 5/4) loamy sand; weak coarse subangular blocky structure; very friable; common roots; slightly acid; clear smooth boundary.

Bw2—11 to 14 inches; light yellowish brown (10YR 6/4) loamy sand; weak medium subangular blocky structure; very friable; common roots; slightly acid; clear smooth boundary.

C1—14 to 28 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; few roots; slightly acid; clear smooth boundary.

C2—28 to 38 inches; pale brown (10YR 6/3) sand; single grain; loose; common coarse faint yellowish brown (10YR 5/4) masses of iron oxide accumulation in the matrix; few roots; slightly acid; clear smooth boundary.

C3—38 to 48 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; many coarse very dark grayish brown (10YR 3/2) organic stains; slightly acid; clear smooth boundary.

C4—48 to 52 inches; yellowish brown (10YR 5/6) sand; single grain; common coarse distinct brown (10YR 5/3) masses of iron oxide accumulation in the matrix; slightly alkaline; abrupt smooth boundary.

Cg—52 to 60 inches; dark grayish brown (10YR 4/2) sand; single grain; loose; few medium prominent yellowish brown (10YR 5/8) masses of iron oxide accumulation in the matrix; slightly alkaline.

Range in Characteristics for MLRA 98

Depth to redoximorphic features: 40 to more than 60 inches

Note: These soils are saturated with water in at least one layer within 40 inches of the mineral surface for 1 month per year in 6 or more out of 10 years.

Depth to sand and gravel: 4 to 24 inches

Depth to the C horizon: 4 to 36 inches

A or Ap horizon:
- Color—hue of 10YR, value of 2 to 4, and chroma of 1 to 3
- Content of rock fragments—0 to 10 percent
- Reaction—slightly acid to neutral

Bw horizon:
- Color—hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 6
- Texture—sand, loamy fine sand, or loamy sand
- Content of rock fragments—0 to 10 percent
- Reaction—slightly acid to slightly alkaline

C or Cg horizon:
- Color—hue of 7.5YR or 10YR, value of 3 to 7, and chroma of 2 to 6
- Texture—dominantly fine sand, sand, coarse sand, gravelly coarse sand, or gravelly sand; loamy sand or loamy fine sand in the upper part in some pedons; gravelly coarse sand common below a depth of 50 inches
- Content of rock fragments—0 to 25 percent
- Reaction—slightly acid to moderately alkaline

AahAK—Abscota loamy sand, 0 to 2 percent slopes, occasionally flooded, brief duration

Setting

Landform: Flood plains (fig. 3)
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Alluvium
Drainage class: Moderately well drained
Available water capacity: Moderate (about 4.0 inches in the upper 60 inches)

Composition

Abscota soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
- Soils that have a dark surface layer more than 10 inches thick
- Soils that contain more clay and less sand in the subsoil than the Abscota soil

Contrasting inclusions:
- Gravelton soils in depressions and natural drainageways
- Waterford soils on the lower swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section

Figure 3.—Flooding of the Elkhart River in an area of Abscota soils.

- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Adrian Series

Taxonomic classification: Sandy or sandy-skeletal, mixed, euic, mesic Terric Haplosaprists

Typical Pedon for the Series

Adrian muck, on a slope of 1 percent, in an area of marsh vegetation; 1,020 feet north and 100 feet east of the southwest corner of sec. 16, T. 9 N., R. 1 W.; Gratiot County, Michigan:

Oa1—0 to 16 inches; muck, black (10YR 2/1) broken face, black (N 2/0) rubbed; about 12 percent fiber, less than 5 percent rubbed; moderate medium granular structure; primarily herbaceous fibers; neutral; abrupt wavy boundary.

Oa2—16 to 20 inches; muck, black (10YR 2/1) broken face, very dark brown (10YR 2/2) rubbed; about 15 percent fiber, less than 5 percent rubbed; weak coarse subangular blocky structure; primarily herbaceous fibers; slightly acid; gradual wavy boundary.

Oa3—20 to 27 inches; muck, black (10YR 2/1) broken face and rubbed; about 12 percent fiber, less than 5 percent rubbed; weak thick platy structure; primarily herbaceous fibers; moderately acid; gradual wavy boundary.

Oa4—27 to 34 inches; muck, black (10YR 2/1) broken face and rubbed; about 12 percent fiber, less than 5 percent rubbed; massive; primarily herbaceous fibers; strongly acid; abrupt smooth boundary.

Cg—34 to 80 inches; gray (10YR 5/1) sand; single grain; loose; common medium prominent light olive brown (2.5Y 5/4) masses of iron oxide accumulation; strongly effervescent; moderately alkaline.

Range in Characteristics for MLRA 98

Depth to sand and gravel: 16 to 51 inches

Surface tier:
Color—hue of 10YR to 5YR or N, value of 2, and chroma of 0 to 3
Reaction—strongly acid to neutral

Subsurface and bottom tiers:
Color—hue of 10YR to 5YR or N, value of 2 or 3, and chroma of 0 to 3
Reaction—strongly acid to neutral

Cg or C horizon:
Color—hue of 5YR to 5Y, value of 2 to 6, and chroma of 1 to 4
Texture—sand, coarse sand, fine sand, loamy sand, gravelly sand, or gravelly loamy sand
Content of rock fragments—0 to 25 percent
Reaction—slightly acid to moderately alkaline

AbhAN—Adrian muck, drained, 0 to 1 percent slopes

Setting

Landform: Flood plains and outwash plains
Position on the landform: Depressions and natural drainageways

Soil Properties and Qualities

Parent material: Organic deposits over outwash
Drainage class: Very poorly drained
Available water capacity: Very high (about 15.1 inches in the upper 60 inches)

Composition

Adrian soil and similar inclusions: 80 percent
Contrasting inclusions: 20 percent

Inclusions

Similar inclusions:
- Houghton soils in the deeper depressions on outwash plains
- Soils that have strata of sand within the muck layers; on flood plains

Contrasting inclusions:
- Edwards and Muskego soils in the deeper depressions on outwash plains
- Gilford soils in the shallower depressions, in natural drainageways, and on flats; on outwash plains

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

AbhAU—Adrian muck, undrained, 0 to 1 percent slopes

Setting

Landform: Flood plains and outwash plains
Position on the landform: Depressions and natural drainageways

Soil Properties and Qualities

Parent material: Organic deposits over outwash
Drainage class: Very poorly drained
Available water capacity: Very high (about 15.1 inches in the upper 60 inches)

Composition

Adrian soil and similar inclusions: 80 percent
Contrasting inclusions: 20 percent

Inclusions

Similar inclusions:
• Houghton and Muskego soils in the deeper depressions on outwash plains
• Soils that have strata of sand within the muck layers; on flood plains
Contrasting inclusions:
• Edwards soils in the deeper depressions on outwash plains
• Gilford soils in the shallower depressions, in natural drainageways, and on flats; on outwash plains

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Windbreaks and Environmental Plantings” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Bainter Series

Taxonomic classification: Coarse-loamy, mixed, semiactive, mesic Mollic Hapludalfs

Typical Pedon for the Series

Bainter sandy loam, 0 to 1 percent slopes (fig. 4), in a cultivated field; 2,520 feet north and 2,335 feet west of the southeast corner of sec. 17, T. 35 N., R. 7 E.; USGS Wallasey topographic quadrangle; latitude 41 degrees 29 minutes 14 seconds N. and longitude 85 degrees 44 minutes 25 seconds W.; Elkhart County, Indiana:

Ap—0 to 9 inches; dark brown (10YR 3/3) sandy loam, brown (10YR 5/3) dry; weak fine and medium granular structure; very friable; common fine and medium roots throughout; common very fine and fine vesicular and tubular pores; 4 percent pebbles; moderately acid; abrupt smooth boundary.

E—9 to 13 inches; 90 percent brown (10YR 4/3) and 10 percent brown (10YR 5/3) sandy loam; weak fine and medium subangular blocky structure; very friable; common fine and medium roots throughout; common very fine and fine vesicular and tubular pores; 1 percent pebbles; moderately acid; clear wavy boundary.

2Bt1—13 to 22 inches; dark yellowish brown (10YR 4/4) sandy loam; weak medium and coarse subangular blocky structure; friable; common very fine and fine roots between peds; common very fine to medium vesicular and tubular pores; few distinct discontinuous brown (7.5YR 4/4) clay films on faces of peds; common distinct discontinuous dark brown (10YR 3/3) organic coats in root channels and/or pores; 13 percent pebbles; slightly acid; clear wavy boundary.

2Bt2—22 to 31 inches; brown (7.5YR 4/4) coarse sandy loam; weak and moderate fine and medium subangular blocky structure; friable; common very fine and fine roots between peds; common very fine to medium vesicular and tubular pores; common distinct discontinuous brown (7.5YR 4/3) clay films on faces of peds and in pores; 11 percent pebbles; neutral; clear wavy boundary.

2Bt3—31 to 39 inches; brown (7.5YR 4/4) gravelly coarse sandy loam; weak and moderate fine and medium subangular blocky structure; friable; common very fine and fine roots between peds; common very fine to medium vesicular and tubular pores; common distinct discontinuous brown (7.5YR 4/3) clay films on faces of peds; 29 percent pebbles; neutral; clear wavy boundary.

2Bt4—39 to 44 inches; brown (7.5YR 4/4) sandy loam; weak fine and medium subangular blocky structure; friable; common very fine and fine roots between peds; common very fine to medium vesicular and tubular pores; common distinct discontinuous dark brown (7.5YR 4/3 and 3/3) clay films on faces of peds and in pores; 12 percent pebbles; neutral; clear smooth boundary.

2Bt5—44 to 54 inches; brown (7.5YR 4/4) sandy clay loam; moderate fine and medium subangular blocky structure; friable; common very fine and

fine roots between peds; common very fine to medium vesicular and tubular pores; common distinct discontinuous dark brown (7.5YR 3/3) clay films on faces of peds; 14 percent pebbles; neutral; clear wavy boundary.

3C—54 to 80 inches; light yellowish brown (10YR 6/4), pale brown (10YR 6/3), and dark grayish brown (10YR 4/2) coarse sand; single grain; loose; 13 percent pebbles; strongly effervescent; slightly alkaline.

Range in Characteristics for MLRA 98

Thickness of the A horizon: 7 to 9 inches
Depth to the base of the argillic horizon: 40 to 70 inches
Depth to sand and gravel: 40 to 70 inches

Ap, A, or AB horizon:
Color—hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 1 to 3
Content of rock fragments—0 to 6 percent
Reaction—moderately acid to neutral

E, EB, BE, or BA horizon (if it occurs):
Color—hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4
Content of rock fragments—0 to 6 percent
Reaction—strongly acid to neutral

2Bt horizon:
Color—hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6
Texture—sandy loam, coarse sandy loam, or sandy clay loam; the gravelly analogs of these textures in the lower part
Content of rock fragments—3 to 15 percent gravel in the upper part and 6 to 35 percent gravel in the lower part; 0 to 5 percent cobbles in the lower part
Reaction—strongly acid to neutral in the upper part and strongly acid to slightly alkaline in the lower part

BC horizon (if it occurs):
Color—hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4
Texture—loamy sand or loamy coarse sand
Content of rock fragments—0 to 6 percent
Reaction—moderately acid to slightly alkaline

3C horizon:
Color—hue of 10YR or 7.5YR, value of 4 to 7, and chroma of 3 or 4
Texture—sand, loamy sand, coarse sand, or gravelly coarse sand
Content of rock fragments—10 to 50 percent gravel and 0 to 5 percent cobbles
Reaction—slightly alkaline or moderately alkaline

BaaA—Bainter sandy loam, 0 to 1 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Well drained
Available water capacity: Moderate (about 6.7 inches in the upper 60 inches)

Composition

Bainter soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
- Soils that have more clay in the subsoil than the Bainter soil
- Soils that have a thinner solum than that of the Bainter soil

Contrasting inclusions:
- Bristol soils on the higher swells
- Bronson soils on the lower swells
- Soils that have a wet substratum; in depressions

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

BaaB—Bainter sandy loam, 1 to 4 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Outwash

Drainage class: Well drained
Available water capacity: Moderate (about 6.7 inches in the upper 60 inches)

Composition

Bainter soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Inclusions

Similar inclusions:
- Soils that have more clay in the subsoil than the Bainter soil
- Soils that do not have a dark surface layer
- Soils that have a thinner solum than that of the Bainter soil

Contrasting inclusions:
- Bristol soils on the higher swells
- Bronson soils on the lower swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Agronomy" section
- "Forestland" section
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" section
- "Soil Properties" section

Baugo Series

Taxonomic classification: Fine-loamy, mixed, semiactive, mesic Aeric Epiaqualfs

Typical Pedon for the Series

Baugo silt loam, 0 to 1 percent slopes, in a cultivated field; 1,930 feet north and 200 feet east of the southwest corner of sec. 3, T. 36 N., R. 4 E.; USGS Wakarusa topographic quadrangle; latitude 41 degrees 35 minutes 59 seconds N. and longitude 86 degrees 3 minutes 34 seconds W.; Elkhart County, Indiana:

Ap1—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; common very fine and fine roots throughout; common medium moderate-continuity and common very fine and fine low-continuity interstitial and tubular pores; neutral; clear smooth boundary.

Ap2—5 to 11 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine subangular blocky structure; friable; common very fine and fine roots throughout; common medium moderate-continuity and common very fine and fine low-continuity interstitial and tubular pores; neutral; abrupt smooth boundary.

Bt—11 to 14 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; common fine roots throughout; common medium moderate-continuity and common fine and very fine low-continuity interstitial and tubular pores; few faint patchy gray (10YR 5/1) clay films on faces of peds; many medium distinct grayish brown (10YR 5/2) iron depletions in the matrix; neutral; clear wavy boundary.

Btg1—14 to 22 inches; grayish brown (10YR 5/2) silty clay loam; moderate medium subangular blocky structure; firm; common fine roots throughout; common medium moderate-continuity and common fine and very fine low-continuity interstitial and tubular pores; common distinct discontinuous gray (10YR 5/1) clay films on faces of peds; many medium distinct yellowish brown (10YR 5/6) masses of iron oxide accumulation in the matrix; common medium rounded black (N 2/0) masses of iron-manganese oxide accumulation throughout; neutral; clear wavy boundary.

Btg2—22 to 29 inches; grayish brown (10YR 5/2) silty clay loam; moderate medium subangular blocky structure; firm; common fine roots throughout; common medium moderate-continuity and common fine and very fine low-continuity interstitial and tubular pores; common faint discontinuous gray (10YR 5/1) clay films on faces of peds; many medium distinct yellowish brown (10YR 5/6) masses of iron oxide accumulation in the matrix; few medium rounded black (N 2/0) masses of iron-manganese oxide accumulation throughout; neutral; clear wavy boundary.

BC—29 to 36 inches; yellowish brown (10YR 5/6) silt loam; weak coarse subangular blocky structure; firm; common fine roots throughout; common medium moderate-continuity and common fine and very fine low-continuity interstitial and tubular pores; few medium rounded black (N 2/0) masses of iron-manganese oxide accumulation throughout; many medium distinct grayish brown (10YR 5/2) iron depletions in the matrix; neutral; abrupt wavy boundary.

2CBg—36 to 42 inches; grayish brown (10YR 5/2) sand; weak coarse subangular blocky structure;

very friable; many medium distinct yellowish brown (10YR 5/4) masses of iron oxide accumulation in the matrix; neutral; clear wavy boundary.

2CB—42 to 51 inches; yellowish brown (10YR 5/4) loamy sand; weak coarse subangular blocky structure; very friable; many medium distinct grayish brown (10YR 5/2) iron depletions in the matrix; neutral; clear wavy boundary.

2C—51 to 56 inches; brown (10YR 5/3), stratified sand and gravelly sand; single grain; loose; common medium distinct gray (10YR 5/1) iron depletions in the matrix; 20 percent gravel and 5 percent cobbles in the lower 2 inches; neutral; abrupt wavy boundary.

3Cd—56 to 80 inches; reddish brown (5YR 5/4) loam; massive; very firm; 3 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics for MLRA 111

Depth to the base of the argillic horizon: 25 to 50 inches
Depth to sand and gravel: 40 to 60 inches
Depth to till: 50 to 80 inches

Ap horizon:
Color—hue of 10YR, value of 4, and chroma of 2 or 3
Content of rock fragments—0 to 3 percent
Reaction—moderately acid to neutral

E horizon (if it occurs):
Color—hue of 10YR, value of 4 or 5, and chroma of 2 or 3
Content of rock fragments—0 to 3 percent
Reaction—moderately acid to neutral

Bt or Btg horizon:
Color—hue of 7.5YR, 10YR, or 2.5Y, value of 4 to 6, and chroma of 1 to 6
Texture—clay loam or silty clay loam
Content of rock fragments—0 to 5 percent
Reaction—moderately acid to neutral

BC or BCg horizon (if it occurs):
Color—hue of 7.5YR, 10YR, or 2.5Y, value of 4 to 6, and chroma of 1 to 6
Texture—loam, silt loam, sandy loam, or fine sandy loam
Content of rock fragments—0 to 5 percent
Reaction—moderately acid to neutral

2CB, 2Cg, or Cg horizon:
Color—hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 6
Texture—loamy sand, sand, gravelly sand, or thin strata of sandy loam, fine sandy loam, and very fine sandy loam
Content of rock fragments—0 to 20 percent gravel and 0 to 5 percent cobbles
Reaction—slightly acid to moderately alkaline

3Cd horizon:
Color—hue of 10YR, 5YR or 2.5Y, value of 4 to 6, and chroma of 1 to 6
Texture—loam or fine sandy loam
Content of rock fragments—0 to 10 percent gravel and 0 to 1 percent cobbles
Reaction—slightly alkaline or moderately alkaline

BbmA—Baugo silt loam, 0 to 1 percent slopes

Setting

Landform: Lake plains and till plains
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Outwash over till
Drainage class: Somewhat poorly drained
Available water capacity: High (about 6.5 inches in the upper 60 inches)

Composition

Baugo soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Inclusions

Similar inclusions:
- Soils that are better drained than the Baugo soil
- Soils that do not have a till substratum
- Soils that have a thicker solum than that of the Baugo soil

Contrasting inclusions:
- Rensselaer soils in depressions and natural drainageways on till plains
- Del Rey soils on swells on lake plains
- Brady soils on the higher swells on till plains

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Blount Series

Taxonomic classification: Fine, illitic, mesic Aeric Epiaqualfs

Typical Pedon for the Series

Blount silt loam, on a northwest-facing, concave slope of 1 percent, in a cultivated field at an elevation of 867 feet; 130 feet west and 1,880 feet south of the northeast corner of sec. 3, T. 6 S., R. 1 E.; USGS Erastus topographic quadrangle; latitude 40 degrees, 33 minutes, 35 seconds N. and longitude 84 degrees, 46 minutes, 45 seconds W.; NAD 1927; Mercer County, Ohio:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine and medium granular structure; friable; common roots; 3 percent pebbles; slightly acid; abrupt smooth boundary.

Btg—7 to 12 inches; grayish brown (10YR 5/2) silty clay; moderate medium subangular structure; firm; common roots; common distinct dark grayish brown (10YR 4/2) clay films on faces of peds; common distinct light gray (10YR 7/1) clay depletions on vertical faces of peds; many distinct yellowish brown (10YR 5/4) irregularly shaped masses of iron accumulation with clear boundaries in the matrix; 3 percent pebbles; strongly acid; clear wavy boundary.

Bt—12 to 23 inches; dark yellowish brown (10YR 4/4) clay; weak fine and medium prismatic structure parting to moderate medium subangular blocky; firm; few roots; many distinct grayish brown (10YR 5/2) clay films on faces of peds; many faint dark grayish brown (10YR 4/2) irregularly shaped iron depletions with clear boundaries in the matrix; common distinct gray (10YR 5/1) irregularly shaped iron depletions with clear boundaries and yellowish brown (10YR 5/6) irregularly shaped masses of iron accumulation with diffuse boundaries in the matrix; 4 percent pebbles; slightly acid; clear wavy boundary.

BCg—23 to 30 inches; grayish brown (10YR 5/2) silty clay loam; weak medium subangular blocky structure; firm; few faint dark grayish brown (10YR 4/2) clay films on vertical faces of peds; few distinct light gray (10YR 7/2) carbonate coats on vertical faces of peds; many distinct dark yellowish brown (10YR 4/4) and common distinct yellowish brown (10YR 5/6) irregularly shaped masses of iron accumulation with clear boundaries in the matrix; 8 percent pebbles; slightly effervescent; slightly alkaline; clear wavy boundary.

CB—30 to 42 inches; brown (10YR 4/3) clay loam; weak medium platy structure; very firm; common distinct white (10YR 8/1) carbonate coats on faces of peds; common faint dark grayish brown (10YR 5/2) irregularly shaped iron depletions with diffuse boundaries in the matrix; 10 percent pebbles; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cd1—42 to 54 inches; brown (10YR 5/3) clay loam; massive; very firm; common distinct light gray (10YR 7/1) carbonate coats on faces of peds; few distinct dark gray (10YR 4/1) irregularly shaped iron depletions with diffuse boundaries in the matrix; 10 percent pebbles; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cd2—54 to 80 inches; brown (10YR 4/3) clay loam; massive; very firm; 10 percent pebbles; strongly effervescent; moderately alkaline.

Range in Characteristics for MLRA 111

Depth to the base of the argillic horizon: 20 to 40 inches; dominantly 28 to 40 inches
Depth to free carbonates: 19 to 40 inches

Ap horizon:
Color—hue of 10YR, value of 3 or 4 (6 dry), and chroma of 1 to 3
Texture—silt loam or loam
Content of rock fragments—0 to 5 percent
Reaction—strongly acid to neutral

A horizon:
Color—hue of 10YR, value of 2 or 3 (4 or 5 dry), and chroma of 1 or 2
Content of rock fragments—0 to 5 percent
Reaction—strongly acid to neutral

E or Eg horizon:
Color—hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2
Texture—silt loam or loam
Content of rock fragments—0 to 5 percent
Reaction—strongly acid to neutral

Bt or Btg horizon:
Color—hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4
Texture—silty clay loam, clay loam, silty clay, or clay
Content of rock fragments—3 to 5 percent
Reaction—very strongly acid to slightly acid in the upper part and moderately acid to slightly alkaline in the lower part

BC or BCg horizon:
Color—hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 6
Texture—silty clay loam, clay loam, or silty clay

Content of rock fragments—3 to 5 percent
Reaction—slightly acid to slightly alkaline

Cd horizon:
Color—hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 6
Texture—silty clay loam or clay loam
Content of rock fragments—5 to 10 percent
Reaction—slightly alkaline or moderately alkaline

BlaA—Blount loam, 0 to 1 percent slopes

Setting

Landform: Till plains
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Glacial till
Drainage class: Somewhat poorly drained
Available water capacity: Moderate (about 8.7 inches in the upper 60 inches)

Composition

Blount soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
- Soils that are better drained than the Blount soil
- Soils that have less clay and more sand in the surface layer and subsoil than the Blount soil
- Soils that have a thicker solum than that of the Blount soil

Contrasting inclusions:
- Glynwood soils on the higher swells and knolls
- Pewamo soils in depressions and natural drainageways

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

BlaB—Blount loam, 1 to 4 percent slopes

Setting

Landform: Till plains
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Glacial till
Available water capacity: Moderate (about 8.7 inches in the upper 60 inches)
Drainage class: Somewhat poorly drained

Composition

Blount soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
- Soils that are better drained than the Blount soil
- Soils that have less clay and more sand in the surface layer and subsoil than the Blount soil
- Soils that are less sloping than the Blount soil
- Soils that have a thicker solum than that of the Blount soil

Contrasting inclusions:
- Glynwood soils on the higher swells and knolls
- Pewamo soils in depressions and natural drainageways

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Brady Series

Taxonomic classification: Coarse-loamy, mixed, active, mesic Aquollic Hapludalfs

Typical Pedon for the Series

Brady sandy loam, on a slope of 1 percent, in a cultivated field about 3 miles southwest of the town of Charlotte; 800 feet east and 500 feet north of the

center of sec. 33, T. 2 N., R. 5 W.; Eaton County, Michigan:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) sandy loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; slightly acid; abrupt smooth boundary.
E—9 to 13 inches; grayish brown (10YR 5/2) sandy loam; weak coarse granular structure; friable; few fine distinct yellowish brown (10YR 5/6) masses of iron oxide accumulation in the matrix; slightly acid; clear wavy boundary.
BE—13 to 23 inches; brown (10YR 5/3) sandy loam; weak coarse subangular blocky structure; friable; many medium distinct gray (10YR 5/1) iron depletions in the matrix; moderately acid; clear wavy boundary.
Bt—23 to 37 inches; dark yellowish brown (10YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; few faint clay films on faces of peds and bridging sand grains; very dark grayish brown (10YR 3/2) sandy loam wormcasts and fillings in root channels; many medium distinct yellowish brown (10YR 5/8) masses of iron oxide accumulation in the matrix; many medium distinct gray (10YR 5/1) iron depletions in the matrix; about 6 percent pebbles; moderately acid; abrupt irregular boundary.
BC—37 to 56 inches; dark brown (7.5YR 4/4) loamy sand; weak coarse subangular blocky structure; very friable; few thin ($^{1}/_{8}$ inch to 2 inches thick) discontinuous layers of dark brown (7.5YR 4/4) sandy loam; few medium distinct yellowish brown (10YR 5/8) masses of iron oxide accumulation in the matrix; few medium distinct gray (10YR 5/1) iron depletions in the matrix; neutral; abrupt irregular boundary.
2C—56 to 60 inches; brown (10YR 5/3) gravelly coarse sand; single grain; loose; common medium distinct gray (10YR 5/1) iron depletions in the matrix; about 15 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics for MLRA 98

Depth to the base of the argillic horizon: 36 to 60 inches
Depth to sand and gravel: 36 to more than 60 inches
Depth to free carbonates: 40 to 60 inches

Ap horizon:
Color—hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 to 3
Content of rock fragments—0 to 25 percent
Reaction—strongly acid to neutral

E, EB, or BE horizon:
Color—hue of 10YR, value of 5 or 6, and chroma of 2 to 4
Texture—sandy loam, fine sandy loam, loamy fine sand, or loamy sand
Content of rock fragments—0 to 25 percent
Reaction—strongly acid to neutral

Bt horizon:
Color—hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6
Texture—dominantly sandy loam or gravelly sandy loam; less commonly sandy clay loam, gravelly sandy clay loam, or clay loam
Content of rock fragments—0 to 25 percent
Reaction—strongly acid to slightly acid

BC or BCg horizon:
Color—hue of 7.5YR or 10YR, value of 4 to 7, and chroma of 2 to 6
Texture—sandy loam or loamy sand
Content of rock fragments—0 to 25 percent
Reaction—strongly acid to neutral

2C or 2Cg horizon:
Color—hue of 10YR, value of 4 to 6, and chroma of 1 to 4
Texture—gravelly coarse sand, coarse sand, sand, gravelly sand, very gravelly sand, or stratified coarse sand and gravel
Content of rock fragments—10 to 55 percent
Reaction—neutral to moderately alkaline

BshA—Brady sandy loam, 0 to 1 percent slopes

Setting

Landform: Outwash plains and outwash terraces
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Till over outwash
Drainage class: Somewhat poorly drained
Available water capacity: Moderate (about 7.6 inches in the upper 60 inches)

Composition

Brady soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
- Soils that are better drained than the Brady soil

• Soils that have less clay and more sand in the solum than the Brady soil
• Soils that have more clay in the subsoil than the Brady soil
• Soils that have a thicker dark surface layer than that of the Brady soil

Contrasting inclusions:

• Brems soils on the higher swells
• Gilford soils in depressions and natural drainageways and on flats
• Morocco soils on swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

• "Agronomy" section
• "Forestland" section
• "Recreation" section
• "Wildlife Habitat" section
• "Engineering" section
• "Soil Properties" section

Brems Series

Taxonomic classification: Mixed, mesic Aquic Udipsamments

Typical Pedon for MLRA 98

Brems loamy sand, 0 to 1 percent slopes, in a cultivated field; 830 feet north and 1,920 feet west of the southeast corner of sec. 10, T. 38 N., R. 5 E.; USGS Elkhart topographic quadrangle; latitude 41 degrees 45 minutes 20 seconds N. and longitude 85 degrees 56 minutes 6 seconds W.; Elkhart County, Indiana:

Ap—0 to 9 inches; dark brown (10YR 3/3) loamy sand, pale brown (10YR 6/3) dry; weak fine granular structure; very friable; common very fine and fine roots throughout; slightly acid; abrupt smooth boundary.

Bw1—9 to 18 inches; dark brown (7.5YR 4/4) loamy sand; weak fine subangular blocky structure; very friable; few very fine and fine roots throughout; few fine tubular pores; moderately acid; gradual wavy boundary.

Bw2—18 to 27 inches; strong brown (7.5YR 4/6) loamy sand; weak fine subangular blocky structure; very friable; few very fine and fine roots throughout; few fine tubular pores; strongly acid; clear wavy boundary.

Bw3—27 to 33 inches; strong brown (7.5YR 4/6) sand; weak medium subangular blocky structure; very friable; few medium distinct brown (7.5YR 4/4) masses of iron oxide accumulation in the matrix; common fine distinct brown (10YR 5/3) iron depletions in the matrix; few medium dark brown (7.5YR 3/4) masses of iron-manganese oxide accumulation throughout; very strongly acid; clear wavy boundary.

Bw4—33 to 46 inches; yellowish brown (10YR 5/6) sand; single grain; loose; common coarse distinct brown (7.5YR 4/4) masses of iron oxide accumulation in the matrix; common fine distinct light brownish gray (10YR 6/2) and pale brown (10YR 6/3) iron depletions in the matrix; few medium dark brown (7.5YR 3/4) masses of iron-manganese oxide accumulation throughout; very strongly acid; clear wavy boundary.

Bw5—46 to 56 inches; yellowish brown (10YR 5/4 and 5/6) sand; single grain; loose; common coarse distinct brown (7.5YR 4/4) masses of iron oxide accumulation in the matrix; common medium distinct light brownish gray (10YR 6/2) iron depletions in the matrix; few medium dark brown (7.5YR 3/4) masses of iron-manganese oxide accumulation throughout; strongly acid; clear wavy boundary.

Bw6—56 to 66 inches; yellowish brown (10YR 5/4 and 5/6) sand; single grain; loose; many medium distinct strong brown (7.5YR 4/6) masses of iron oxide accumulation in the matrix; many medium distinct light gray (10YR 7/2) iron depletions in the matrix; few medium dark brown (7.5YR 3/4) masses of iron-manganese oxide accumulation throughout; strongly acid; clear wavy boundary.

Bw7—66 to 72 inches; yellowish brown (10YR 5/4) and strong brown (7.5YR 4/6) sand; single grain; common fine distinct strong brown (7.5YR 4/6) masses of iron oxide accumulation in the matrix; common fine distinct light brownish gray (10YR 6/2) iron depletions in the matrix; strongly acid; clear wavy boundary.

BC—72 to 80 inches; yellowish brown (10YR 5/4) sand; common fine distinct light brownish gray (10YR 6/2) iron depletions in the matrix; strongly acid.

Range in Characteristics for MLRA 98

Depth to the C horizon: 35 to 80 inches
Depth to redoximorphic features: 24 to 40 inches

A or Ap horizon:

Color—hue of 10YR, value of 3 to 5, and chroma of 2 to 4
Content of rock fragments—0 to 10 percent
Reaction—strongly acid to slightly acid

Bw horizon:
Color—hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 8
Texture—loamy sand, loamy fine sand, sand, or fine sand
Content of rock fragments—0 to 10 percent
Reaction—very strongly acid to moderately acid

BC, BCg, C, or Cg horizon:
Color—hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 2 to 6
Texture—loamy sand, loamy fine sand, sand, or fine sand
Content of rock fragments—0 to 10 percent
Reaction—dominantly strongly acid; slightly acid or moderately acid in some pedons

BteA—Brems loamy sand, 0 to 1 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Moderately well drained
Available water capacity: Low (about 4.5 inches in the upper 60 inches)

Composition

Brems soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
- Soils that are better drained than the Brems soil

Contrasting inclusions:
- Morocco soils on the lower swells
- Tyner soils on the higher swells and on shoulders and backslopes

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

BteB—Brems loamy sand, 1 to 4 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Moderately well drained
Available water capacity: Low (about 4.5 inches in the upper 60 inches)

Composition

Brems soil and similar inclusions: 80 percent
Contrasting inclusions: 20 percent

Inclusions

Similar inclusions:
- Soils that are less sloping than the Brems soil
- Soils that have more clay in the subsoil than the Brems soil

Contrasting inclusions:
- Morocco soils on the lower swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Bristol Series

Taxonomic classification: Mixed, mesic Psammentic Hapludalfs

Typical Pedon for the Series

Bristol loamy sand, 0 to 2 percent slopes, in a cultivated field; 785 feet north and 60 feet east of the southwest corner of sec. 8, T. 37 N., R. 6 E.; USGS Bristol topographic quadrangle; latitude 41 degrees 40 minutes 9 seconds N. and longitude 85 degrees 52 minutes 8 seconds W.; Elkhart County, Indiana:

Ap—0 to 10 inches; dark brown (10YR 4/3) loamy sand, pale brown (10YR 6/3) dry; weak fine granular structure; very friable; few very fine and

fine roots throughout; 3 percent gravel; moderately acid; abrupt smooth boundary.
E—10 to 21 inches; dark yellowish brown (10YR 4/4) loamy sand, light yellowish brown (10YR 6/4) dry; weak fine subangular blocky structure; very friable; few very fine and fine roots throughout; few fine tubular pores; 7 percent gravel; slightly acid; clear wavy boundary.
Bt1—21 to 35 inches; dark brown (7.5YR 4/4) loamy coarse sand; moderate medium subangular blocky structure; friable; few very fine roots throughout; common faint discontinuous brown (10YR 4/3) clay films on faces of peds; 13 percent gravel; slightly acid; clear wavy boundary.
Bt2—35 to 40 inches; dark brown (7.5YR 4/4) sand; moderate medium subangular blocky structure; very friable; common faint discontinuous brown (10YR 4/3) clay films on faces of peds; 2 percent gravel; moderately acid; clear wavy boundary.
Bt3—40 to 55 inches; dark yellowish brown (10YR 4/4) sand; weak medium subangular blocky structure; very friable; dark brown (7.5YR 4/4) clay bridges between sand grains; 1 percent gravel; moderately acid; clear wavy boundary.
Bt/C—55 to 80 inches; 60 percent dark yellowish brown (10YR 4/4) sand (Bt); weak medium subangular blocky structure; very friable; dark brown (7.5YR 4/4) clay bridges between sand grains; 2 percent gravel; the B part occurs as tongues; 40 percent brown (10YR 5/3) sand (C); single grain; loose; 2 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics for MLRA 98

Depth to the base of the argillic horizon: 40 to more than 80 inches

A or Ap horizon:
Color—hue of 10YR, value of 2 to 4, and chroma of 2 or 3
Content of rock fragments—0 to 14 percent gravel
Reaction—strongly acid to neutral

E horizon:
Color—hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 or 4
Content of rock fragments—0 to 14 percent gravel
Reaction—strongly acid to neutral

Bt horizon or Bt part of Bt/C horizon:
Color—hue of 5YR, 7.5YR, or 10YR, value of 4 or 5, and chroma of 4 to 6
Texture—sand or loamy sand
Content of rock fragments—1 to 25 percent gravel
Reaction—strongly acid to neutral

C horizon or C part of Bt/C horizon:
Color—hue of 10YR, value of 5, and chroma of 3 or 4
Texture—sand, gravelly sand, loamy sand, or gravelly loamy sand
Content of rock fragments—1 to 30 percent
Reaction—slightly alkaline or moderately alkaline

BtxA—Bristol loamy sand, 0 to 2 percent slopes

Setting

Landform: Outwash plains, outwash terraces, and kames
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Excessively drained
Available water capacity: Low (about 4.7 inches in the upper 60 inches)

Composition

Bristol soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Inclusions

Similar inclusions:
• Soils that have less clay in the subsoil than the Bristol soil
• Soils that are more sloping than the Bristol soil
Contrasting inclusions:
• Osolo and Vistula soils on the lower swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Agronomy" section
- "Forestland" section
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" section
- "Soil Properties" section

BtxB—Bristol loamy sand, 2 to 5 percent slopes

Setting

Landform: Outwash plains, outwash terraces, and kames
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Excessively drained
Available water capacity: Low (about 4.7 inches in the upper 60 inches)

Composition

Bristol soil and similar inclusions: 80 percent
Contrasting inclusions: 20 percent

Inclusions

Similar inclusions:
• Soils that have less clay in the subsoil than the Bristol soil
• Soils that are less sloping than the Bristol soil
• Soils that have more clay in the subsoil than the Bristol soil
Contrasting inclusions:
• Brady, Bronson, Osolo, and Vistula soils on the lower swells
• Soils that are more sloping than the Bristol soil

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

BtxC—Bristol loamy sand, 5 to 10 percent slopes

Setting

Landform: Outwash plains, outwash terraces, and kames
Position on the landform: Backslopes and shoulders

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Excessively drained
Available water capacity: Low (about 4.7 inches in the upper 60 inches)

Composition

Bristol soil and similar inclusions: 80 percent
Contrasting inclusions: 20 percent

Inclusions

Similar inclusions:
• Soils that have less clay in the subsoil than the Bristol soil
• Soils that are less sloping than the Bristol soil
• Soils that have more clay in the subsoil than the Bristol soil
• Soils that have a thinner solum than that of the Bristol soil
Contrasting inclusions:
• Riddles soils on swells, backslopes, and shoulders
• Soils that are more sloping than the Bristol soil

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

BtxD2—Bristol loamy sand, 10 to 18 percent slopes, eroded

Setting

Landform: Outwash plains, outwash terraces, and kames
Position on the landform: Backslopes

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Excessively drained
Available water capacity: Low (about 4.7 inches in the upper 60 inches)

Composition

Bristol soil and similar inclusions: 75 percent
Contrasting inclusions: 25 percent

Inclusions

Similar inclusions:
• Soils that have less clay in the subsoil than the Bristol soil
• Soils that are less sloping than the Bristol soil
• Soils that have more clay in the subsoil than the Bristol soil
• Soils that have a thinner solum than that of the Bristol soil

Contrasting inclusions:
• Riddles soils on backslopes; on kames
• Soils that are more sloping than the Bristol soil

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Windbreaks and Environmental Plantings” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

BtxE—Bristol loamy sand, 18 to 30 percent slopes

Setting

Landform: Outwash plains, outwash terraces, and kames
Position on the landform: Backslopes

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Excessively drained
Available water capacity: Low (about 4.7 inches in the upper 60 inches)

Composition

Bristol soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Inclusions

Similar inclusions:
• Soils that have less clay in the subsoil than the Bristol soil
• Soils that are less sloping than the Bristol soil
• Soils that have more clay in the subsoil than the Bristol soil
• Soils that have a thinner solum than that of the Bristol soil
Contrasting inclusions:
• Soils that are more sloping than the Bristol soil

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Windbreaks and Environmental Plantings” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Bronson Series

Taxonomic classification: Coarse-loamy, mixed, active, mesic Aquic Hapludalfs

Typical Pedon for MLRA 98

Bronson sandy loam, 0 to 1 percent slopes, in a cultivated field; 120 feet north and 600 feet east of the southwest corner of sec. 14, T. 37 N., R. 7 E.; USGS Middlebury topographic quadrangle; latitude 41 degrees 39 minutes 18 seconds N. and longitude 85 degrees 41 minutes 41 seconds W.; Elkhart County, Indiana:

Ap—0 to 8 inches; dark brown (10YR 3/3) sandy loam, brown (10YR 5/3) dry; weak fine granular structure; friable; many fine and very fine roots throughout; many fine and medium tubular pores; 8 percent gravel; slightly acid; abrupt smooth boundary.

E—8 to 12 inches; dark yellowish brown (10YR 4/4) sandy loam, light yellowish brown (10YR 6/4) dry; weak medium subangular blocky and moderate medium granular structure; friable; common fine and very fine roots throughout; many fine and medium tubular pores; 8 percent gravel; slightly acid; clear wavy boundary.

BE—12 to 18 inches; dark brown (7.5YR 4/4) loamy sand; moderate medium subangular blocky and weak medium subangular blocky structure; friable; few very fine roots throughout; many fine and medium tubular pores; 8 percent gravel; slightly acid; clear wavy boundary.

Bt1—18 to 24 inches; yellowish brown (10YR 5/6) sandy loam; moderate medium subangular blocky structure; friable; few very fine roots throughout; common fine and medium tubular pores; thin discontinuous dark brown (10YR 4/4) clay films on faces of peds; 8 percent gravel; slightly acid; clear wavy boundary.

Bt2—24 to 30 inches; dark brown (7.5YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; few very fine roots throughout; common fine and medium tubular pores; thin patchy dark brown (10YR 4/3) clay films on faces of peds; thin dark brown (10YR 3/3) organic coats in pores; few fine irregular black (N 2/0) masses of iron-manganese oxide accumulation throughout;

common fine prominent grayish brown (10YR 5/2) iron depletions in the matrix; 3 percent gravel; slightly acid; clear wavy boundary.

Bt3—30 to 42 inches; dark brown (7.5YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; few very fine roots throughout; common fine and medium tubular pores; thin discontinuous dark grayish brown (10YR 4/2) coatings on faces of peds; many medium distinct dark reddish brown (5YR 3/4) masses of iron oxide accumulation in the matrix; few fine irregular black (N 2/0) masses of iron-manganese oxide accumulation throughout; many medium distinct grayish brown (10YR 5/2) iron depletions in the matrix; 8 percent gravel; neutral; clear wavy boundary.

Bt4—42 to 51 inches; dark yellowish brown (10YR 4/4) sandy loam; weak medium subangular blocky structure; friable; few fine tubular pores; dark brown (7.5YR 4/4) clay bridges between sand grains; few fine faint dark yellowish brown (10YR 3/4) masses of iron oxide accumulation throughout; many medium distinct grayish brown (10YR 5/2) iron depletions in the matrix; 8 percent gravel; neutral; clear wavy boundary.

Bt5—51 to 61 inches; dark yellowish brown (10YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; few patchy dark brown (7.5YR 4/4) clay bridges between sand grains; many medium distinct grayish brown (10YR 5/2) iron depletions in the matrix; 8 percent gravel; neutral; clear wavy boundary.

2C—61 to 80 inches; yellowish brown (10YR 5/4) gravelly sand; single grain; loose; 15 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics for MLRA 98

Depth to the base of the argillic horizon: 40 to 70 inches
Depth to sand and gravel: 40 to 70 inches
Depth to free carbonates: 40 to 70 inches

Ap horizon:
Color—hue of 10YR, value of 3 to 5, and chroma of 2 to 4
Content of rock fragments—3 to 15 percent
Reaction—strongly acid to neutral

A horizon:
Color—hue of 10YR, value of 3 or 4, and chroma of 1 or 2
Content of rock fragments—3 to 15 percent
Reaction—strongly acid to neutral

E, EB, or BE horizon:
Color—hue of 10YR or 7.5YR, value of 4 to 7, and chroma of 2 to 4
Texture—sand or loamy sand
Content of rock fragments—3 to 25 percent
Reaction—strongly acid to neutral

Bt horizon:
Color—hue of 7.5YR or 10YR, value and chroma of 3 to 6
Texture—sandy loam, sandy clay loam, or the gravelly analogs of these textures
Content of rock fragments—3 to 25 percent
Reaction—strongly acid to neutral

2C horizon:
Color—hue of 10YR, value of 5 or 6, and chroma of 2 to 4
Texture—sand, coarse sand, gravelly sand, or gravelly coarse sand
Content of rock fragments—10 to 50 percent
Reaction—slightly alkaline or moderately alkaline

BufA—Bronson sandy loam, 0 to 1 percent slopes

Setting

Landform: Outwash plains and moraines
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Moderately well drained
Available water capacity: Moderate (about 8.6 inches in the upper 60 inches)

Composition

Bronson soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Inclusions

Similar inclusions:
- Soils that are better drained than the Bronson soil
- Soils that have more than 20 inches of loamy sand in the upper part of the solum
- Soils that have a darker surface layer than that of the Bronson soil

Contrasting inclusions:
- Brady soils on the lower swells on till plains
- Gilford soils in depressions and natural drainageways and on flats

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Brookston Series

Taxonomic classification: Fine-loamy, mixed, superactive, mesic Typic Argiaquolls

Typical Pedon for the Series

Brookston loam, 0 to 1 percent slopes, in a cultivated field; 1,257 feet north and 1,900 feet east of the southwest corner of sec. 18, T. 35 N., R. 5 E.; USGS Nappanee East topographic quadrangle; latitude 41 degrees 28 minutes 57 seconds N. and longitude 85 degrees 59 minutes 44 seconds W.; Elkhart County, Indiana:

Ap1—0 to 5 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; moderate fine granular structure; friable; common very fine and fine roots throughout; common very fine and fine low-continuity interstitial and tubular pores; neutral; abrupt smooth boundary.

Ap2—5 to 9 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; weak coarse granular structure; firm; common very fine and fine roots throughout; common very fine and fine low-continuity interstitial and tubular pores; slightly acid; abrupt smooth boundary.

A—9 to 16 inches; very dark gray (10YR 3/1) clay loam, dark gray (10YR 4/1) dry; moderate medium subangular blocky structure; friable; common very fine and fine roots throughout; common very fine and fine moderate-continuity interstitial and tubular pores; 1 percent gravel; neutral; clear wavy boundary.

Btg1—16 to 25 inches; dark gray (10YR 4/1) clay loam; moderate medium subangular blocky structure; firm; common very fine and fine roots throughout; common very fine and fine moderate-continuity interstitial and tubular pores; common distinct continuous dark gray (10YR 4/1) clay films on faces of peds; common fine and medium distinct dark yellowish brown (10YR 4/4) masses of iron oxide accumulation in the matrix; neutral; clear wavy boundary.

Btg2—25 to 38 inches; grayish brown (10YR 5/2) clay loam; weak medium prismatic structure; firm; common very fine and fine roots between peds; common very fine and fine moderate-continuity interstitial and tubular pores; common distinct continuous dark gray (10YR 4/1) clay films on faces of peds; many fine and medium distinct dark yellowish brown (10YR 4/4) masses of iron oxide accumulation in the matrix; 2 percent gravel; neutral; gradual wavy boundary.

2Bt—38 to 48 inches; brown (10YR 5/3) loam; moderate very coarse prismatic structure parting to weak medium subangular blocky; firm; common distinct continuous gray (10YR 5/1) clay films on faces of peds; many fine and medium distinct dark yellowish brown (10YR 4/4) masses of iron oxide accumulation in the matrix; 2 percent gravel; neutral; gradual wavy boundary.

2BC1—48 to 58 inches; dark yellowish brown (10YR 4/4) loam; moderate very coarse prismatic structure parting to weak medium subangular blocky; firm; few distinct continuous gray (10YR 5/1) clay films on vertical faces of peds; many fine and medium distinct grayish brown (10YR 5/2) iron depletions in the matrix; neutral; gradual wavy boundary.

2BC2—58 to 68 inches; dark yellowish brown (10YR 4/4) loam; moderate very coarse prismatic structure parting to weak medium subangular blocky; very firm; few distinct continuous gray (10YR 5/1) clay films on vertical faces of peds; many fine and medium distinct grayish brown (10YR 5/2) iron depletions in the matrix; strongly effervescent on prism faces; slightly effervescent within prisms; moderately alkaline; gradual wavy boundary.

2C—68 to 80 inches; yellowish brown (10YR 5/4) loam; massive; very firm; few distinct continuous gray (10YR 6/1) carbonate coats on vertical faces of peds; strongly effervescent; moderately alkaline.

Range in Characteristics for MLRA 111

Thickness of the mollic epipedon: 10 to 16 inches
Depth to the base of the argillic horizon: 30 to 70 inches

A or Ap horizon:
Color—hue of 10YR, value of 2 or 3, and chroma of 1 or 2
Texture—loam or clay loam
Content of rock fragments—0 to 5 percent
Reaction—slightly acid or neutral

AB horizon (if it occurs):
Color—hue of 10YR, value of 2 or 3, and chroma of 1 or 2
Texture—loam or clay loam
Content of rock fragments—0 to 5 percent
Reaction—slightly acid or neutral

Btg horizon:
Color—hue of 10YR, value of 4 to 6, and chroma of 1 or 2
Texture—clay loam or loam
Content of rock fragments—0 to 11 percent
Reaction—slightly acid or neutral

2Bt or 2Btg horizon:
Color—hue of 10YR, value of 4 to 6, and chroma of 1 to 4
Texture—clay loam or loam
Content of rock fragments—0 to 11 percent
Reaction—slightly acid to slightly alkaline

2BC or 2BCg horizon:
Color—hue of 10YR, value of 4 to 6, and chroma of 1 to 4
Content of rock fragments—0 to 11 percent
Reaction—slightly acid to moderately alkaline

2Cd, 2Cdg, 2Cg, or 2C horizon:
Color—hue of 10YR, value of 5 or 6, and chroma of 1 to 4
Content of rock fragments—0 to 11 percent
Reaction—slightly alkaline or moderately alkaline

BuuA—Brookston loam, 0 to 1 percent slopes

Setting

Landform: Till plains
Position on the landform: Depressions

Soil Properties and Qualities

Parent material: Glacial till
Drainage class: Poorly drained
Available water capacity: High (about 9.7 inches in the upper 60 inches)

Composition

Brookston soil and similar inclusions: 80 percent
Contrasting inclusions: 20 percent

Inclusions

Similar inclusions:
- Soils that have less clay and more sand in the subsoil than the Brookston soil

Contrasting inclusions:
- Rensselaer soils in the deeper depressions and natural drainageways and on flats
- Crosier soils on swells
- Milford soils in the deeper depressions and natural drainageways

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Coloma Series

Taxonomic classification: Mixed, mesic Lamellic Udipsamments

Typical Pedon for MLRA 98

Coloma sand, 2 to 5 percent slopes, in a tree nursery field; 900 feet east and 1,050 feet north of the southwest corner of sec. 21, T. 38 N., R. 7 E.; USGS Middlebury topographic quadrangle; latitude 41 degrees 43 minutes 43 seconds N. and longitude 85 degrees 44 minutes 2 seconds W.; Elkhart County, Indiana:

Ap—0 to 12 inches; brown (10YR 4/3) sand, brown (10YR 5/3) dry; weak fine granular structure; very friable; many fine and medium roots throughout; 1 percent pebbles; neutral; abrupt smooth boundary.
Bw1—12 to 20 inches; yellowish brown (10YR 5/6) sand; weak fine granular structure; very friable; common fine, medium, and coarse roots throughout; 1 percent pebbles; neutral; gradual wavy boundary.
Bw2—27 to 37 inches; brownish yellow (10YR 6/6) sand; single grain; loose; common fine and medium roots throughout; 1 percent pebbles; neutral; clear wavy boundary.
Bw3—37 to 47 inches; brownish yellow (10YR 6/6) sand; single grain; loose; common fine and medium roots throughout; neutral; clear wavy boundary.
E&Bt—47 to 80 inches; light yellowish brown (10YR 6/4) sand (E); single grain; loose; several wavy and discontinuous lamellae of brown (7.5YR 4/4)

loamy sand (Bt) 1/8 to 1/2 inch thick (combined thickness of approximately 3 1/2 inches); weak medium subangular blocky structure; very friable; common fine roots throughout; slightly acid.

Range in Characteristics for MLRA 98

Depth to the top of the lamellae: 30 to 60 inches
Combined thickness of the lamellae: 1.0 to 5.5 inches

A or Ap horizon:
Color—hue of 7.5YR or 10YR, value of 2 to 4, and chroma of 1 to 3
Content of rock fragments—0 to 15 percent gravel, 0 to 5 percent cobbles
Reaction—very strongly acid to slightly acid (except in areas that have been limed)

Bw horizon:
Color—hue of 7.5YR or 10YR, value and chroma of 4 to 6
Texture—sand, loamy sand, or fine sand
Content of rock fragments—0 to 15 percent gravel, 0 to 5 percent cobbles
Reaction—very strongly acid to slightly acid (except in areas that have been limed)

Bt part of E&Bt horizon:
Color—hue of 5YR, 7.5YR, or 10YR, value of 3 to 5, and chroma of 3 to 6
Texture—sand, sandy loam, or loamy sand
Content of rock fragments—0 to 15 percent gravel, 0 to 5 percent cobbles
Reaction—dominantly very strongly acid to slightly acid; very strongly acid to neutral in the lower part

E part of E&Bt horizon:
Color—hue of 7.5YR or 10YR, value of 4 to 7, and chroma of 4 to 6
Texture—sand or loamy sand
Content of rock fragments—0 to 15 percent gravel, 0 to 5 percent cobbles
Reaction—dominantly very strongly acid to slightly acid; very strongly acid to neutral in the lower part

CnbA—Coloma sand, 0 to 2 percent slopes

Setting

Landform: Moraines and outwash plains
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Somewhat excessively drained
Available water capacity: Low (about 4.7 inches in the upper 60 inches)

Composition

Coloma soil and similar inclusions: 95 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
- Soils that have more clay in the subsoil than the Coloma soil
- Soils that do not have lamellae

Contrasting inclusions:
- Osolo soils on the lower swells
- Soils that are more sloping than the Coloma soil

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

CnbB—Coloma sand, 2 to 5 percent slopes

Setting

Landform: Moraines and outwash plains
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Somewhat excessively drained
Available water capacity: Low (about 4.7 inches in the upper 60 inches)

Composition

Coloma soil and similar inclusions: 95 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
- Soils that have more clay in the subsoil than the Coloma soil
- Soils that do not have lamellae

Contrasting inclusions:
- Osolo soils on the lower swells
- Soils that are more sloping than the Coloma soil

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

CnbC—Coloma sand, 5 to 10 percent slopes

Setting

Landform: Moraines and outwash plains
Position on the landform: Backslopes and shoulders

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Somewhat excessively drained
Available water capacity: Low (about 4.7 inches in the upper 60 inches)

Composition

Coloma soil and similar inclusions: 95 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
- Soils that do not have lamellae
- Soils that have more clay in the subsoil than the Coloma soil
- Soils that are less sloping than the Coloma soil

Contrasting inclusions:
- Soils that are more sloping than the Coloma soil

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Cosperville Series

Taxonomic classification: Fine, mixed, active, mesic Typic Hapludalfs

Typical Pedon for the Series

Cosperville loam, 2 to 5 percent slopes, in a cultivated field; 1,290 feet east and 2,590 feet north of the southwest corner of sec. 35, T. 36 N., R. 7 E.; USGS Millersburg topographic quadrangle; latitude 41 degrees 31 minutes 52 seconds N. and longitude 85 degrees 41 minutes 40 seconds W.; Elkhart County, Indiana:

Ap1—0 to 6 inches; brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; weak thin platy structure parting to moderate fine granular; friable; many very fine and fine roots throughout; common fine and medium interstitial and tubular pores; 3 percent gravel; neutral; abrupt smooth boundary.

Ap2—6 to 9 inches; brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; weak thick platy structure parting to moderate fine granular; friable; common very fine and fine roots throughout; common fine and medium interstitial and tubular pores; 3 percent gravel; slightly acid; abrupt smooth boundary.

Bt1—9 to 16 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; common very fine and fine roots throughout; common fine and medium interstitial and tubular pores; few distinct continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; few distinct continuous light gray (10YR 7/2) silt coatings on vertical faces of peds; few fine distinct yellowish brown (10YR 5/6) masses of iron oxide accumulation in the matrix; 3 percent gravel; slightly acid; clear wavy boundary.

Bt2—16 to 22 inches; brown (10YR 4/3) clay loam; weak medium prismatic structure parting to strong fine and medium angular blocky; firm; common very fine and fine roots throughout; common very fine and fine interstitial and tubular pores; many distinct continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; common fine distinct brown (7.5YR 4/4) and yellowish brown (10YR 5/6) masses of iron oxide accumulation in the matrix; few fine rounded very dark gray (7.5YR 3/1) masses of iron-manganese oxide accumulation throughout; 3 percent gravel; neutral; clear wavy boundary.

Bt3—22 to 29 inches; brown (10YR 5/3) clay loam; moderate medium prismatic structure parting to moderate medium and coarse subangular blocky;

firm; common very fine and fine roots throughout; common very fine and fine interstitial and tubular pores; many distinct continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; common fine distinct yellowish brown (10YR 5/6) masses of iron oxide accumulation in the matrix; few fine rounded very dark gray (7.5YR 3/1) masses of iron-manganese oxide accumulation throughout; 3 percent gravel; neutral; clear wavy boundary.

Bt4—29 to 38 inches; yellowish brown (10YR 5/4) clay loam; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; common very fine and fine roots throughout; common very fine and fine interstitial and tubular pores; many distinct continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; common fine distinct yellowish brown (10YR 5/6) masses of iron oxide accumulation in the matrix; few fine rounded very dark gray (7.5YR 3/1) masses of iron-manganese oxide accumulation throughout; 3 percent gravel; neutral; clear wavy boundary.

BC—38 to 48 inches; brown (10YR 5/3) silty clay loam; moderate coarse prismatic structure parting to moderate coarse subangular blocky; firm; common very fine and fine roots throughout; common very fine and fine interstitial and tubular pores; few distinct discontinuous brown (10YR 4/3) clay films on faces of peds; few fine rounded light gray (10YR 7/1) masses of carbonate accumulation on faces of peds; 3 percent gravel; strongly effervescent; moderately alkaline; clear wavy boundary.

CB—48 to 64 inches; yellowish brown (10YR 5/4) loam; weak very coarse prismatic structure parting to weak thick platy; friable; common very fine and fine interstitial and tubular pores; few distinct discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; few fine rounded light gray (10YR 7/1) masses of carbonate accumulation on faces of peds; few fine distinct strong brown (7.5YR 5/6) masses of iron oxide accumulation in the matrix; 2 percent gravel; strongly effervescent; moderately alkaline; gradual wavy boundary.

C1—64 to 76 inches; light olive brown (2.5Y 5/4) loam; weak very coarse prismatic structure parting to weak thick platy; friable; common very fine and fine interstitial and tubular pores; few fine rounded light gray (10YR 7/1) masses of carbonate accumulation on faces of peds; common medium faint reddish brown (5YR 5/4) masses of iron oxide accumulation; 2 percent gravel; strongly effervescent; moderately alkaline; abrupt wavy boundary.

2C2—76 to 84 inches; yellowish brown (10YR 5/4) and brown (10YR 5/3) fine sand and sand; single grain; loose; 2 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics for MLRA 111

Depth to the base of the argillic horizon: 36 to 70 inches
Depth to sand and gravel: 40 to 80 inches
Depth to free carbonates: 30 to 70 inches

Ap horizon:
Color—hue of 10YR, value of 2 to 4 (6 or more dry), and chroma of 2 or 3
Content of rock fragments—0 to 10 percent
Reaction—moderately acid to neutral

E, EB, or BE horizon (if it occurs):
Color—hue of 10YR, value of 4 or 5, and chroma of 1 to 4
Texture—loam
Content of rock fragments—0 to 10 percent
Reaction—moderately acid or slightly acid

Bt horizon:
Color—hue of 7.5YR, 10YR, or 2.5Y, value of 4 or 5, and chroma of 3 to 6
Texture—clay loam, silty clay loam, or silty clay
Content of rock fragments—0 to 10 percent
Reaction—moderately acid or slightly acid in the upper part and slightly acid or neutral in the lower part

BC or BCg horizon:
Color—hue of 10YR, value of 4 or 5, and chroma of 2 to 4
Texture—clay loam or silty clay loam
Content of rock fragments—0 to 10 percent
Reaction—slightly acid to moderately alkaline

CB, CBg, Cg, or C horizon:
Color—hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 4
Texture—clay loam or loam
Content of rock fragments—0 to 10 percent
Reaction—slightly alkaline or moderately alkaline

2Bt or 2BC horizon (if it occurs):
Color—hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6
Texture—sandy loam, loamy sand, gravelly sandy loam, or gravelly loamy sand
Content of rock fragments—0 to 20 percent
Reaction—slightly acid to slightly alkaline

2C horizon:
Color—hue of 10YR, value of 5, and chroma of 3 or 4
Texture—sand, fine sand, loamy fine sand, gravelly sand, or loamy sand
Content of rock fragments—0 to 20 percent
Reaction—slightly alkaline or moderately alkaline

CosA—Cosperville loam, 0 to 2 percent slopes

Setting

Landform: Till plains
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Till over outwash
Drainage class: Well drained
Available water capacity: High (about 7.8 inches in the upper 60 inches)

Composition

Cosperville soil and similar inclusions: 80 percent
Contrasting inclusions: 20 percent

Inclusions

Similar inclusions:
• Soils that are sand and gravelly sand more than 80 inches deep
Contrasting inclusions:
• Blount soils on swells
• Kimmell soils on the lower swells
• Soils in which the water table is closer to the surface than that in the Cosperville soil
• Soils that are more sloping than the Cosperville soil

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

CosB—Cosperville loam, 2 to 5 percent slopes

Setting

Landform: Till plains
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Till over outwash
Drainage class: Well drained
Available water capacity: High (about 7.8 inches in the upper 60 inches)

Composition

Cosperville soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
• Eroded soils
• Soils that are sand and gravelly sand more than 80 inches deep
Contrasting inclusions:
• Blount soils on swells
• Kimmell soils on the lower swells
• Soils in which the water table is closer to the surface than that in the Cosperville soil

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Crosier Series

Taxonomic classification: Fine-loamy, mixed, active, mesic Aeric Epiaqualfs

Typical Pedon for the Series

Crosier loam, 0 to 1 percent slopes, in a cultivated field; 280 feet south and 560 feet east of the northwest corner of sec. 11, T. 36 N., R. 3 E.; St. Joseph County, Indiana:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; 1 percent gravel; neutral; abrupt smooth boundary.
Eg—8 to 11 inches; grayish brown (10YR 5/2) loam, light gray (10YR 7/2) dry; weak medium subangular blocky structure; friable; common medium distinct yellowish brown (10YR 5/6) masses of iron oxide accumulation in the matrix; light gray (10YR 7/1) clay depletions on faces of

peds; 1 percent gravel; slightly acid; clear smooth boundary.

Btg—11 to 20 inches; grayish brown (10YR 5/2) clay loam; moderate medium subangular blocky structure; firm; thin continuous dark gray (10YR 4/1) clay films on faces of peds; many coarse distinct yellowish brown (10YR 5/8) masses of iron oxide accumulation in the matrix; 5 percent gravel; slightly acid; gradual wavy boundary.

Bt—20 to 30 inches; brown (10YR 5/3) clay loam; moderate coarse subangular blocky structure; firm; thin continuous dark gray (10YR 4/1) clay films on faces of peds; common medium distinct yellowish brown (10YR 5/6) masses of iron oxide accumulation in the matrix; many medium faint grayish brown (10YR 5/2) iron depletions in the matrix; neutral; gradual wavy boundary.

BC—30 to 38 inches; brown (10YR 5/3) loam; moderate coarse subangular blocky structure; friable; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds and in pores; thin gray (10YR 6/1) carbonate coats and clay depletions on faces of some peds; common medium distinct yellowish brown (10YR 5/6) masses of iron oxide accumulation in the matrix; 3 percent gravel; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cd—38 to 60 inches; brown (10YR 5/3) loam; massive; very firm; few gray (10YR 6/1) carbonate coats on faces of peds; few medium distinct yellowish brown (10YR 5/6) masses of iron oxide accumulation in the matrix; strongly effervescent; moderately alkaline.

Range in Characteristics for MLRA 111

Depth to the base of the argillic horizon: 24 to 40 inches
Depth to sand and gravel: More than 60 inches
Depth to free carbonates: 20 to 40 inches

Ap horizon:
Color—hue of 10YR, value of 3 to 5 (6 or more dry), and chroma of 2 or 3
Content of rock fragments—0 to 5 percent
Reaction—moderately acid to neutral

E, Eg, EB, EBg, BEg, or BE horizon:
Color—hue of 10YR, value of 5 or 6, and chroma of 1 or 2
Content of rock fragments—0 to 5 percent
Reaction—strongly acid to neutral

Bt or Btg horizon:
Color—hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 6
Texture—clay loam, sandy clay loam, or loam
Content of rock fragments—0 to 5 percent
Reaction—strongly acid to neutral

BC, BCg, CB, or CBg horizon:
Color—hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 6
Texture—loam or sandy loam
Content of rock fragments—0 to 8 percent
Reaction—slightly acid to moderately alkaline

C, Cg, Cd, or Cdg horizon:
Color—hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 6
Texture—loam or fine sandy loam
Content of rock fragments—0 to 8 percent
Reaction—slightly alkaline or moderately alkaline

CvdA—Crosier loam, 0 to 1 percent slopes

Setting

Landform: Till plains
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Glacial till
Drainage class: Somewhat poorly drained
Available water capacity: High (about 7.0 inches in the upper 60 inches)

Composition

Crosier soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Inclusions

Similar inclusions:
- Soils that have a darker surface layer than that of the Crosier soil
- Soils that are more sloping than the Crosier soil
- Soils that have a thicker or thinner solum than that of the Crosier soil
- Soils that have a surface layer of sandy loam

Contrasting inclusions:
- Baugo and Selfridge soils on swells
- Brookston soils in depressions
- Rensselaer soils in depressions and natural drainageways and on flats

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section

- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

CvdB—Crosier loam, 1 to 4 percent slopes

Setting

Landform: Till plains
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Glacial till
Drainage class: Somewhat poorly drained
Available water capacity: High (about 7.0 inches in the upper 60 inches)

Composition

Crosier soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
- Soils that are less sloping than the Crosier soil
- Soils that have a surface layer of sandy loam
- Soils that have a thicker or thinner solum than that of the Crosier soil

Contrasting inclusions:
- Baugo and Selfridge soils on swells
- Brookston soils in depressions
- Riddles soils on the higher swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Del Rey Series

Taxonomic classification: Fine, illitic, mesic Aeric Epiaqualfs

Typical Pedon for MLRA 111

Del Rey silty clay loam, 0 to 1 percent slopes, in a cultivated field; 1,000 feet south and 282 feet west of the northeast corner of sec. 9, T. 36 N., R. 5 E.; USGS Foraker topographic quadrangle; latitude 41 degrees 35 minutes 28 seconds N. and longitude 85 degrees 56 minutes 46 seconds W.; Elkhart County, Indiana:

Ap1—0 to 6 inches; brown (10YR 4/3) silty clay loam; weak medium granular structure; friable; common very fine and fine roots throughout; common fine moderate-continuity interstitial and tubular pores; neutral; abrupt smooth boundary.

Ap2—6 to 9 inches; brown (10YR 4/3) silty clay loam; weak fine subangular blocky structure; friable; common very fine and fine roots throughout; common fine moderate-continuity interstitial and tubular pores; neutral; clear wavy boundary.

Bt1—9 to 12 inches; yellowish brown (10YR 5/6) silty clay; moderate fine subangular blocky structure; firm; common very fine and fine roots throughout; common very fine and fine low-continuity interstitial and tubular pores; common distinct continuous grayish brown (10YR 5/2) clay films on faces of peds; many medium distinct gray (10YR 5/1) iron depletions throughout; neutral; clear wavy boundary.

Bt2—12 to 22 inches; yellowish brown (10YR 5/4) silty clay; moderate medium subangular blocky structure; firm; common fine roots throughout; common very fine and fine low-continuity interstitial and tubular pores; few distinct continuous grayish brown (10YR 5/2) and dark gray (10YR 4/1) clay films on faces of peds; many medium distinct grayish brown (10YR 5/2) iron depletions throughout; neutral; clear wavy boundary.

Bt3—22 to 26 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; common very fine roots throughout; common very fine and fine low-continuity interstitial and tubular pores; few distinct continuous gray (10YR 5/1) and dark gray (10YR 4/1) clay films on faces of peds; many medium distinct grayish brown (10YR 5/2) iron depletions throughout; neutral; clear wavy boundary.

BC—26 to 33 inches; yellowish brown (10YR 5/6) silty clay loam; weak medium prismatic structure parting to moderate medium and coarse subangular blocky; firm; common very fine roots in cracks; common very fine low-continuity interstitial and tubular pores; few distinct continuous gray (10YR 5/1) clay films on faces of peds; few distinct continuous white (10YR 8/1) carbonate coats on vertical faces of peds; few medium irregular white (10YR 8/1) carbonate nodules throughout; many medium distinct grayish brown (10YR 5/2) iron depletions throughout; strongly effervescent; moderately alkaline; clear wavy boundary.

C1—33 to 48 inches; yellowish brown (10YR 5/6) silty clay loam; weak very coarse prismatic structure; very firm; common very fine roots in cracks; common very fine low-continuity interstitial and tubular pores; few distinct continuous gray (10YR 5/1) clay films on faces of peds; few distinct continuous white (10YR 8/1) carbonate coats on vertical faces of peds; few medium irregular white (10YR 8/1) carbonate nodules throughout; many medium distinct grayish brown (10YR 5/2) iron depletions throughout; strongly effervescent; moderately alkaline; clear wavy boundary.

2C2—48 to 66 inches; yellowish brown (10YR 5/4) silty clay loam; weak very coarse prismatic structure; very firm; few distinct continuous gray (10YR 6/1) carbonate coats on vertical faces of peds; few medium irregular white (10YR 8/1) carbonate nodules throughout; common medium distinct grayish brown (10YR 5/2) iron depletions throughout; strongly effervescent; slightly alkaline; clear wavy boundary.

2C3—66 to 82 inches; yellowish brown (10YR 5/6) silty clay loam; massive; firm; many medium distinct gray (10YR 5/1) iron depletions throughout; strongly effervescent; moderately alkaline; clear wavy boundary.

2Cg—82 to 90 inches; gray (10YR 5/1) silty clay loam; massive; firm; many medium distinct yellowish brown (10YR 5/6) iron depletions throughout; strongly effervescent; moderately alkaline.

Range in Characteristics for MLRA 111

Depth to the base of the argillic horizon: 24 to 48 inches
Depth to sand and gravel: More than 80 inches
Depth to free carbonates: 24 to 48 inches

Ap horizon:
Color—hue of 10YR, value of 4, and chroma of 1 to 3
Reaction—moderately acid to neutral

A horizon:
Color—hue of 10YR, value of 3 or 4, and chroma of 1 to 3
Texture—silt loam, silty clay loam, or loam
Reaction—moderately acid to neutral

E or Eg horizon (if it occurs):
Color—hue of 10YR, value of 4 to 6, and chroma of 2 or less
Texture—silt loam or silty clay loam
Reaction—moderately acid to neutral

Bt or Btg horizon:
Color—hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 to 6
Texture—silty clay loam or silty clay
Reaction—very strongly acid to neutral

BC or BCg horizon:
Color—hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 to 8
Texture—silty clay loam or silty clay
Reaction—slightly acid to moderately alkaline

C, Cd, or Cg horizon:
Color—hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 to 8
Texture—silt loam or silty clay loam
Reaction—moderately alkaline

DcrA—Del Rey silty clay loam, 0 to 1 percent slopes

Setting

Landform: Lake plains
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Lacustrine deposits
Drainage class: Somewhat poorly drained
Available water capacity: High (about 8.5 inches in the upper 60 inches)

Composition

Del Rey soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Inclusions

Similar inclusions:
- Soils that are better drained than the Del Rey soil
- Soils that have a surface layer of loam or silt loam

Contrasting inclusions:
- Baugo soils on the higher swells
- Milford soils in depressions and natural drainageways and on flats

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section

- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Desker Series

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Mollic Hapludalfs

Typical Pedon for the Series

Desker sandy loam (fig. 5), 1 to 6 percent slopes, in a cultivated field; 2,480 feet west and 2,270 feet north of the southeast corner of sec. 6, T. 21 N., R. 4 W.; Tippecanoe County, Indiana:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) sandy loam, dark brown (10YR 4/3) dry; common coarse dark brown (7.5YR 3/4) pockets of subsoil material; moderate medium granular structure; friable; 12 percent gravel; slightly acid; abrupt smooth boundary.

Bt1—9 to 15 inches; dark brown (7.5YR 3/4) gravelly sandy loam; moderate fine subangular blocky structure; friable; thin continuous dark brown (7.5YR 3/2) clay films on faces of peds; 15 percent gravel; slightly acid; clear smooth boundary.

Bt2—15 to 25 inches; dark brown (7.5YR 3/4) gravelly coarse sandy loam; weak fine subangular blocky structure; friable; thin continuous dark brown (7.5YR 3/2) clay films on faces of peds; 18 percent gravel; neutral; clear wavy boundary.

BC—25 to 34 inches; dark yellowish brown (10YR 4/4) gravelly loamy coarse sand; weak medium subangular blocky structure; very friable; thin discontinuous dark brown (7.5YR 3/2) clay coatings bridging sand grains; 20 percent gravel; slightly effervescent; moderately alkaline; abrupt irregular boundary.

C—34 to 60 inches; brown (10YR 5/3), stratified sand and gravelly coarse sand; single grain; loose; 25 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics for MLRA 111

Thickness of the Ap horizon: 7 to 9 inches
Depth to the base of the argillic horizon: 20 to 40 inches
Depth to sand and gravel: 20 to 40 inches

Ap horizon:
Color—hue of 10YR, value of 3, and chroma of 2 or 3
Content of rock fragments—5 to 14 percent
Reaction—moderately acid or slightly acid

Bt horizon:
Color—hue of 7.5YR, value and chroma of 3 or 4
Texture—gravelly sandy loam in the upper part and gravelly coarse sandy loam or gravelly loamy coarse sand in the lower part
Content of rock fragments—12 to 35 percent
Reaction—moderately acid to neutral in the upper part and neutral to moderately alkaline in the lower part

C or BC horizon:
Color—hue of 10YR, value of 5, and chroma of 3 or 4
Texture—stratified sand and gravelly coarse sand
Content of rock fragments—20 to 50 percent
Reaction—moderately alkaline

DdeA—Desker sandy loam, 0 to 1 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Outwash
Depth class: Moderately deep
Drainage class: Well drained
Available water capacity: Low (about 4.5 inches in the upper 60 inches)

Composition

Desker soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
- Soils that have a lighter colored surface layer than that of the Desker soil
- Soils that have more clay in the subsoil than the Desker soil
- Soils that have a thicker or thinner solum than that of the Desker soil
- Soils that have a thicker or thinner surface layer than that of the Desker soil

Contrasting inclusions:
- Bainter soils on swells
- Brady and Matherton soils on the lower swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

DdeB—Desker sandy loam, 1 to 6 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Outwash
Depth class: Moderately deep
Drainage class: Well drained
Available water capacity: Low (about 4.5 inches in the upper 60 inches)

Composition

Desker soil and similar inclusions: 80 percent
Contrasting inclusions: 20 percent

Inclusions

Similar inclusions:
- Soils that have a lighter colored surface layer than that of the Desker soil
- Soils that have more clay in the subsoil than the Desker soil
- Soils that have a thicker or thinner solum than that of the Desker soil
- Soils that have a thicker or thinner surface layer than that of the Desker soil

Contrasting inclusions:
- Bainter soils on swells
- Brady and Matherton soils on the lower swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Edwards Series

Taxonomic classification: Marly, euic, mesic Limnic Haplosaprists

Typical Pedon for the Series

Edwards muck, 0 to 1 percent slopes, in a brushy area; 1,805 feet south and 420 feet east of the northwest corner of sec. 18, T. 3 S., R. 4 E.; Washtenaw County, Michigan:

Oa1—0 to 9 inches; muck, black (10YR 2/1) broken face and rubbed; about 5 percent fiber before and after rubbing; moderate fine granular structure; friable; very dark grayish brown (10YR 3/2) sodium pyrophosphate; herbaceous fibers; slightly alkaline; abrupt smooth boundary.

Oa2—9 to 15 inches; muck, black (10YR 2/1) broken face, very dark brown (10YR 2/2) rubbed; about 10 percent fiber, less than 5 percent rubbed; weak thick platy structure; friable; very dark grayish brown (10YR 3/2) sodium pyrophosphate; herbaceous fibers; slightly alkaline; clear smooth boundary.

Oa3—15 to 32 inches; muck, black (10YR 2/1) broken face and rubbed; about 15 percent fiber, 5 percent rubbed; weak thick platy structure; friable; very dark grayish brown (10YR 3/2) sodium pyrophosphate; herbaceous fibers; slightly alkaline; clear smooth boundary.

Lca—32 to 60 inches; light gray (10YR 7/1) marl; massive; friable; violently effervescent; moderately alkaline.

Range in Characteristics for MLRA 98

Depth to marl: 16 to 51 inches

Surface tier (Oa or Op horizon):
Color—hue of 10YR or N, value of 2 or 3, and chroma of 0 to 2
Reaction—very strongly acid to slightly alkaline

Subsurface tiers (Oa horizon):
Color—hue of 10YR, 5YR, or N, value of 2 to 4, and chroma of 0 to 3
Reaction—very strongly acid to slightly alkaline

Lca horizon:
Color—hue of 10YR to 5Y, value of 4 to 8, and chroma of 1 or 2
Reaction—slightly alkaline or moderately alkaline

EchAN—Edwards muck, drained, 0 to 1 percent slopes

Setting

Landform: Outwash plains and till plains
Position on the landform: Depressions

Soil Properties and Qualities

Parent material: Organic deposits over marl
Drainage class: Very poorly drained
Available water capacity: Very high (about 9.6 inches in the upper 60 inches)

Composition

Edwards soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
- Adrian soils in the shallower depressions and natural drainageways on outwash plains
- Houghton and Muskego soils in the shallower depressions

Contrasting inclusions:
- Madaus soils in the shallower depressions on outwash plains

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

EchAU—Edwards muck, undrained, 0 to 1 percent slopes

Setting

Landform: Outwash plains and till plains
Position on the landform: Depressions

Soil Properties and Qualities

Parent material: Organic deposits over marl
Drainage class: Very poorly drained
Available water capacity: Very high (about 9.6 inches in the upper 60 inches)

Composition

Edwards soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
- Adrian soils in the shallower depressions and natural drainageways on outwash plains
- Houghton and Muskego soils in the shallower depressions

Contrasting inclusions:
- Madaus soils in the shallower depressions on outwash plains

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Windbreaks and Environmental Plantings” section
- “Forestland” section
- “Recreation” section
- “Engineering” section
- “Soil Properties” section

Gilford Series

Taxonomic classification: Coarse-loamy, mixed, superactive, mesic Typic Endoaquolls

Typical Pedon for the Series

Gilford sandy loam, 0 to 1 percent slopes, in a cultivated field; 1,900 feet west and 50 feet north of the southeast corner of sec. 24, T. 38 N., R. 3 E.; St. Joseph County, Indiana:

Ap—0 to 11 inches; black (10YR 2/1) sandy loam, dark gray (10YR 4/1) dry; moderate fine granular structure; friable; slightly acid; abrupt smooth boundary.

A—11 to 14 inches; very dark gray (10YR 3/1) sandy loam, gray (10YR 5/1) dry; weak fine subangular blocky structure; friable; slightly acid; gradual wavy boundary.

Bg1—14 to 20 inches; gray (10YR 5/1) sandy loam; weak medium subangular blocky structure; friable; common fine distinct yellowish brown (10YR 5/6) masses of iron oxide accumulation in the matrix; moderately acid; clear irregular boundary.

Bg2—20 to 32 inches; gray (10YR 5/1) sandy loam; moderate medium subangular blocky structure; firm; common fine distinct yellowish brown (10YR

5/6) masses of iron oxide accumulation in the matrix; slightly acid; clear wavy boundary.
2BCg—32 to 38 inches; gray (10YR 6/1) loamy sand; weak fine subangular blocky structure; very friable; common medium distinct strong brown (7.5YR 5/6) masses of iron oxide accumulation in the matrix; neutral; clear wavy boundary.
2Cg1—38 to 48 inches; gray (10YR 6/1) sand; single grain; loose; neutral; clear wavy boundary.
2Cg2—48 to 60 inches; gray (10YR 6/1) coarse sand; single grain; loose; strongly effervescent; moderately alkaline.

Range in Characteristics for MLRA 98

Thickness of the mollic epipedon: 10 to 24 inches
Depth to the base of the cambic horizon: 30 to 40 inches
Depth to sand and gravel: 30 to 40 inches

A or Ap horizon:
Color—hue of 10YR or N, value of 2 or 3, and chroma of 0 to 2
Texture—sandy loam or mucky sandy loam
Content of rock fragments—0 to 3 percent
Reaction—moderately acid to neutral

Bg horizon:
Color—hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2
Texture—fine sandy loam or sandy loam
Content of rock fragments—0 to 5 percent
Reaction—moderately acid to neutral

BCg or 2BCg horizon:
Color—hue of 7.5YR, 10YR, or 2.5Y, value of 4 to 6, and chroma of 1 or 2
Texture—loamy sand or loamy fine sand
Content of rock fragments—0 to 5 percent
Reaction—slightly acid or neutral

C, Cg, 2C, or 2Cg horizon:
Color—hue of 10YR or 2.5Y, value of 4 to 7, and chroma of 1 to 3
Texture—loamy sand, sand, coarse sand, or fine sand
Content of rock fragments—0 to 5 percent
Reaction—slightly acid or neutral above a depth of 40 inches and neutral to moderately alkaline below that depth

GczA—Gilford sandy loam, 0 to 1 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Depressions, natural drainageways, and flats

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Poorly drained
Available water capacity: Moderate (about 6.0 inches in the upper 60 inches)

Composition

Gilford soil and similar inclusions: 75 percent
Contrasting inclusions: 25 percent

Inclusions

Similar inclusions:
• Soils that have 10 to 35 percent gravel below a depth of 60 inches
• Soils that have more sand and less clay in the subsoil than the Gilford soil
• Soils that have a surface layer of mucky loam
• Soils that have a thicker solum than that of the Gilford soil
Contrasting inclusions:
• Brady soils on swells
• Rensselaer soils in the shallower depressions and natural drainageways and on flats
• Sebewa soils in depressions and natural drainageways and on flats

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

GdnA—Gilford mucky sandy loam, 0 to 1 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Depressions

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Very poorly drained
Available water capacity: Moderate (about 7.1 inches in the upper 60 inches)

Composition

Gilford soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
• Soils that have more sand and less clay in the subsoil than the Gilford soil
• Soils that have a surface layer of sandy loam
• Soils that have a thicker or thinner solum than that of the Gilford soil
Contrasting inclusions:
• Adrian soils in the deeper depressions on outwash plains
• Rensselaer soils in the shallower depressions and natural drainageways and on flats
• Sebewa soils in depressions

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

• “Agronomy” section
• “Forestland” section
• “Recreation” section
• “Wildlife Habitat” section
• “Engineering” section
• “Soil Properties” section

Glynwood Series

Taxonomic classification: Fine, illitic, mesic Aquic Hapludalfs

Typical Pedon for the Series

Glynwood silt loam, 1 to 5 percent slopes, in a cultivated field; 500 feet east and 900 feet north of the southwest corner of sec. 17, T. 5 S., R. 5 E.; Auglaize County, Ohio:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; many roots; few fine dark iron and manganese oxide concretions; slightly acid; abrupt smooth boundary.

E—7 to 9 inches; brown (10YR 4/3) silt loam; weak very thin platy structure; friable; many roots; many wormcasts; few fine faint yellowish brown (10YR 5/6) masses of iron oxide accumulation; few fine dark masses of iron and manganese oxide concretions; slightly acid; abrupt wavy boundary.

BE—9 to 12 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak medium prismatic structure parting to moderate medium and fine subangular blocky; firm; common roots; common medium distinct yellowish brown (10YR 5/6) and prominent yellowish brown (10YR 5/8) masses of iron oxide accumulation in the matrix; many prominent pale brown (10YR 6/3) and brown (10YR 5/3) clay depletions on faces of peds; moderately acid; clear smooth boundary.

2Bt—12 to 23 inches; dark yellowish brown (10YR 4/4) clay; moderate medium prismatic structure parting to strong medium and coarse angular blocky; firm; common roots; many prominent dark brown (10YR 3/3) clay films on faces of peds; common distinct brown (10YR 5/3) silt coats on faces of peds; few fine prominent strong brown (7.5YR 5/8) masses of iron oxide accumulation in the matrix; common fine distinct grayish brown (10YR 5/2) iron depletions in the matrix; many fine dark iron-manganese oxide concretions; less than 2 percent gravel; strongly acid in the upper part grading to neutral in the lower part; clear wavy boundary.

2BC—23 to 32 inches; yellowish brown (10YR 5/4) clay loam; very weak very coarse prismatic structure parting to weak coarse subangular blocky; firm; few roots; common prominent brown (10YR 4/3) clay films on vertical faces of peds; common prominent pale brown (10YR 6/3) carbonate coats on vertical faces of peds; common fine faint yellowish brown (10YR 5/6) masses of iron oxide accumulation; many fine dark iron-manganese oxide concretions; less than 5 percent gravel; strongly effervescent; moderately alkaline; clear smooth boundary.

2Cd—32 to 60 inches; yellowish brown (10YR 5/4) clay loam; massive; very firm; some vertical cleavage planes with pale brown (10YR 6/3) and gray (5Y 5/1) carbonate coats; few distinct strong brown (7.5YR 5/6 and 5/8) masses of iron oxide accumulation; few fine dark iron-manganese oxide concretions; less than 5 percent till pebbles; strongly effervescent; moderately alkaline.

Range in Characteristics for MLRA 111

Depth to the base of the argillic horizon: 22 to 45 inches
Depth to free carbonates: 19 to 40 inches
Other features: Some pedons have an A horizon. This horizon is 1 to 6 inches thick. It has hue of 10YR, value of 2 or 3, and chroma of 1 or 2.

Ap horizon:
Color—hue of 10YR, value of 4 or 5 (6 dry), and chroma of 1 to 3
Texture—silt loam or loam
Content of rock fragments—2 to 5 percent
Reaction—strongly acid to neutral

E, EB, or BE horizon:
Color—hue of 10YR, value of 4 or 5, and chroma of 2 to 4
Texture—loam or silt loam
Content of rock fragments—0 to 5 percent
Reaction—very strongly acid to neutral

Bt, Btg, 2Bt, or 2Btg horizon:
Color—hue of 10YR, value of 4 or 5, and chroma of 2 to 6
Texture—silty clay loam, clay loam, clay, or silty clay
Content of rock fragments—0 to 5 percent
Reaction—very strongly acid to neutral in the upper part and moderately acid to slightly alkaline in the lower part

BC, BCg, 2BC, or 2BCg horizon:
Color—hue of 10YR, value of 4 or 5, and chroma of 2 to 6
Texture—clay loam or silty clay loam
Content of rock fragments—1 to 5 percent
Reaction—neutral or slightly alkaline

C, Cg, 2C, or 2Cg horizon:
Color—hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 6
Texture—silty clay loam or clay loam
Content of rock fragments—1 to 10 percent
Reaction—slightly alkaline or moderately alkaline

GlaB—Glynwood loam, 1 to 5 percent slopes

Setting

Landform: Till plains
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Glacial till
Drainage class: Moderately well drained
Available water capacity: Moderate (about 7.0 inches in the upper 60 inches)

Composition

Glynwood soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Inclusions

Similar inclusions:
- Soils that are better drained than the Glynwood soil
- Soils that have more sand and less clay in the upper part of the subsoil than the Glynwood soil
- Severely eroded soils

Contrasting inclusions:
- Blount soils on the lower swells
- Soils that are more sloping than the Glynwood soil

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

GlaC—Glynwood loam, 5 to 10 percent slopes

Setting

Landform: Till plains
Position on the landform: Knolls, backslopes, and shoulders

Soil Properties and Qualities

Parent material: Glacial till
Drainage class: Moderately well drained
Available water capacity: Moderate (about 7.0 inches in the upper 60 inches)

Composition

Glynwood soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
- Soils that are better drained than the Glynwood soil
- Soils that have more sand and less clay in the upper part of the subsoil than the Glynwood soil
- Severely eroded soils

Contrasting inclusions:
- Blount soils on the lower swells
- Soils that are more sloping than the Glynwood soil

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section

- “Engineering” section
- “Soil Properties” section

Granby Series

Taxonomic classification: Sandy, mixed, mesic Typic Endoaquolls

Typical Pedon for the Series

Granby loamy sand, 0 to 1 percent slopes, in a cultivated field; 350 feet east and 400 feet north of the center of sec. 28, T. 7 N., R. 15 W.; Ottawa County, Michigan:

Ap—0 to 10 inches; black (10YR 2/1) loamy sand, dark grayish brown (10YR 4/2) dry; weak medium granular structure; very friable; neutral; abrupt wavy boundary.
Bg1—10 to 16 inches; dark gray (10YR 4/1) sand; weak coarse subangular blocky structure; very friable; few medium faint light brownish gray (10YR 6/2) iron depletions in the matrix; slightly acid; gradual wavy boundary.
Bg2—16 to 32 inches; light brownish gray (10YR 6/2) sand; weak coarse subangular blocky structure; very friable; common medium faint dark gray (10YR 4/1) and gray (10YR 5/1) iron depletions in the matrix; neutral; clear wavy boundary.
Cg—32 to 60 inches; light gray (10YR 7/2) sand; single grain; loose; common medium faint grayish brown (10YR 5/2) and few medium faint gray (10YR 5/1) iron depletions in the matrix; neutral.

Range in Characteristics for MLRA 98

Thickness of the mollic epipedon: 10 to 15 inches
Depth to the Cg horizon: 20 to 52 inches

A or Ap horizon:
Color—hue of 10YR or N, value of 2 or 3, and chroma of 0 to 2
Reaction—moderately acid to neutral

Bg horizon:
Color—hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 3, or hue of 5Y and chroma of 3 or less with distinct or prominent redoximorphic features
Texture—fine sand, sand, loamy sand, or loamy fine sand
Content of rock fragments—0 to 5 percent
Reaction—moderately acid to slightly alkaline

Cg horizon:
Color—hue of 10YR to 5Y, value of 4 to 7, and chroma of 1 to 4
Texture—sand, coarse sand, fine sand, or loamy sand
Content of rock fragments—0 to 5 percent
Reaction—neutral to moderately alkaline

GndA—Granby loamy sand, 0 to 1 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Depressions, natural drainageways, and flats

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Very poorly drained
Available water capacity: Low (about 5.0 inches in the upper 60 inches)

Composition

Granby soil and similar inclusions: 95 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
- Soils that are better drained than the Granby soil
- Soils that have a surface layer of mucky loamy sand
- Soils that have a thicker or thinner surface layer than that of the Granby soil

Contrasting inclusions:
- Adrian soils in the deeper depressions and natural drainageways
- Gilford soils in the deeper depressions and natural drainageways and on flats
- Morocco soils on swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Gravelton Series

Taxonomic classification: Sandy, mixed, mesic Fluvaquentic Endoaquolls

Typical Pedon for the Series

Gravelton loam, 0 to 1 percent slopes, frequently flooded, long duration, in a wooded area; 450 feet south and 2,000 feet east of the northwest corner of sec. 16, T. 36 N., R. 6 E.; USGS Goshen topographic quadrangle; latitude 41 degrees 34 minutes 45 seconds N. and longitude 85 degrees 50 minutes 27 seconds W.; Elkhart County, Indiana:

A—0 to 11 inches; very dark grayish brown (10YR 3/2) loam; moderate medium granular structure; friable; many very fine and fine roots throughout; many very fine and fine moderate-continuity interstitial and tubular pores; neutral; clear wavy boundary.

Bg—11 to 16 inches; dark grayish brown (10YR 4/2) loam; moderate fine subangular blocky structure; friable; many very fine and fine roots throughout; many very coarse moderate-continuity interstitial and tubular pores throughout; common fine distinct brown (7.5YR 4/4) masses of iron oxide accumulation in the matrix; common medium faint dark gray (10YR 4/1) iron depletions in the matrix; neutral; clear wavy boundary.

2C1—16 to 23 inches; brown (10YR 5/3) sand; single grain; loose; many coarse distinct yellowish red (5YR 4/6) masses of iron oxide accumulation in the matrix; common medium faint grayish brown (10YR 5/2) iron depletions in the matrix; slightly effervescent; slightly alkaline; clear wavy boundary.

3C2—23 to 36 inches; yellowish brown (10YR 5/4) sand; single grain; loose; many medium distinct grayish brown (10YR 5/2) iron depletions in the matrix; 10 percent gravel; strongly effervescent; slightly alkaline; clear wavy boundary.

3C3—36 to 48 inches; yellowish brown (10YR 5/4) gravelly coarse sand; single grain; many medium distinct grayish brown (10YR 5/2) iron depletions in the matrix; loose; 25 percent gravel; strongly effervescent; slightly alkaline; clear wavy boundary.

3Cg—48 to 80 inches; gray (10YR 5/1) very gravelly coarse sand; single grain; loose; 40 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics for MLRA 98

Thickness of the mollic epipedon: 10 to 18 inches
Depth to the base of the cambic horizon: 14 to 24 inches
Depth to sand and gravel: 16 to 24 inches
Depth to free carbonates: 14 to 24 inches

A horizon:
Color—hue of 10YR to 5YR, value of 2 or 3, and chroma of 1 or 2
Content of rock fragments—0 to 8 percent
Reaction—slightly acid to slightly alkaline

Bg horizon:
Color—hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 1 or 2
Texture—loam or sandy loam
Content of rock fragments—0 to 10 percent
Reaction—neutral or slightly alkaline

2C or 2Cg horizon:
Color—hue of 10YR, 2.5Y, or 5Y, value of 3 to 5, and chroma of 1 to 3
Texture—sand or coarse sand
Content of rock fragments—0 to 10 percent
Reaction—slightly alkaline or moderately alkaline

3C or 3Cg horizon:
Color—hue of 10YR, 2.5Y, or 5Y, value of 3 to 5, and chroma of 1 to 4
Texture—sand, gravelly coarse sand, or very gravelly coarse sand
Content of rock fragments—10 to 50 percent
Reaction—slightly alkaline or moderately alkaline

GocAK—Gravelton loam, 0 to 1 percent slopes, occasionally flooded, brief duration

Setting

Landform: Flood plains
Position on the landform: Depressions and natural drainageways

Soil Properties and Qualities

Parent material: Alluvium
Depth class: Moderately deep
Drainage class: Very poorly drained
Available water capacity: Low (about 3.7 inches in the upper 60 inches)

Composition

Gravelton soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
- Soils that have less gravel in the substratum than the Gravelton soil
- Soils that have thicker loamy sediments than the Gravelton soil
- Soils that have a mucky surface layer

Contrasting inclusions:
- Adrian soils in the deeper depressions and natural drainageways

• Waterford soils on swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

GodAI—Gravelton loam, 0 to 1 percent slopes, frequently flooded, long duration

Setting

Landform: Flood plains
Position on the landform: Depressions and natural drainageways

Soil Properties and Qualities

Parent material: Alluvium
Depth class: Moderately deep
Drainage class: Very poorly drained
Available water capacity: Low (about 3.7 inches in the upper 60 inches)

Composition

Gravelton soil and similar inclusions: 75 percent
Contrasting inclusions: 25 percent

Inclusions

Similar inclusions:
• Soils that have less gravel in the substratum than the Gravelton soil
• Soils that have a mucky surface layer
• Soils that have thicker loamy sediments than the Gravelton soil
Contrasting inclusions:
• Adrian soils in the deeper depressions and natural drainageways
• Waterford soils on swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Windbreaks and Environmental Plantings” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

HhaAP—Histosols, 0 to 1 percent slopes, ponded

Setting

Landform: Outwash plains, lake plains, and moraines
Position on the landform: Depressions

Soil Properties and Qualities

Parent material: Organic, herbaceous materials
Drainage class: Very poorly drained
Available water capacity: Very high (about 17.4 inches in the upper 60 inches)

Composition

Histosols and similar inclusions: 95 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
• Edwards, Houghton, Madaus, Muskego, and Palms soils in depressions
Contrasting inclusions:
• Aquolls in the shallower depressions
• Areas of surface water

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Windbreaks and Environmental Plantings” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Houghton Series

Taxonomic classification: Euic, mesic Typic Haplosaprists

Typical Pedon for the Series

Houghton muck, 0 to 1 percent slopes, in a cultivated field; 200 feet north and 800 feet east of the southwest corner of sec. 12, T. 5 N., R. 1 W.; Clinton County, Michigan:

Oa1—0 to 9 inches; muck, black (N 2/0) broken face

and rubbed; about 5 percent fiber, a trace rubbed; weak coarse subangular blocky structure; neutral; abrupt smooth boundary.

Oa2—9 to 13 inches; muck, black (N 2/0) broken face, very dark brown (7.5YR 2/2) rubbed; about 5 percent fiber, a trace rubbed; weak medium granular structure; neutral; abrupt smooth boundary.

Oa3—13 to 24 inches; muck, dark reddish brown (5YR 3/2) broken face, dark reddish brown (5YR 2/2) rubbed; about 15 percent fiber, less than 5 percent rubbed; massive; thick platy fragments; neutral; abrupt smooth boundary.

Oa4—24 to 32 inches; muck, black (5YR 2/1) broken face and rubbed; about 10 percent fiber, a trace rubbed; massive; few woody fragments; neutral; clear wavy boundary.

Oa5—32 to 48 inches; muck, dark reddish brown (5YR 2/2) broken face, black (5YR 2/1) rubbed; about 20 percent fiber, less than 10 percent rubbed; massive; thick platy fragments; neutral; abrupt smooth boundary.

Oa6—48 to 66 inches; muck, dark reddish brown (5YR 2/2) broken face and rubbed; about 10 percent fiber, less than 10 percent rubbed; massive; slightly sticky; about 15 percent mineral soil; neutral.

Range in Characteristics for MLRA 98

Oa horizon:
Color—hue of 10YR, 7.5YR, 5YR, or N, value of 2 or 3, and chroma of 0 to 3
Reaction—very strongly acid to slightly alkaline

HtbAN—Houghton muck, drained, 0 to 1 percent slopes

Setting

Landform: Outwash plains and moraines
Position on the landform: Depressions

Soil Properties and Qualities

Parent material: Organic, herbaceous materials
Drainage class: Very poorly drained
Available water capacity: Very high (about 23.6 inches in the upper 60 inches)

Composition

Houghton soil and similar inclusions: 75 percent
Contrasting inclusions: 25 percent

Inclusions

Similar inclusions:
- Adrian soils in the shallower depressions and natural drainageways on outwash plains
- Soils that have a loamy substratum

Contrasting inclusions:
- Edwards soils in the deeper depressions on outwash plains
- Muskego soils in the deeper depressions on moraines

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

HtbAU—Houghton muck, undrained, 0 to 1 percent slopes

Setting

Landform: Outwash plains and moraines
Position on the landform: Depressions

Soil Properties and Qualities

Parent material: Organic, herbaceous materials
Drainage class: Very poorly drained
Available water capacity: Very high (about 23.6 inches in the upper 60 inches)

Composition

Houghton soil and similar inclusions: 75 percent
Contrasting inclusions: 25 percent

Inclusions

Similar inclusions:
- Adrian soils in the shallower depressions and natural drainageways on outwash plains
- Soils that have a loamy substratum

Contrasting inclusions:
- Edwards soils in the deeper depressions on outwash plains
- Muskego soils in the deeper depressions on moraines
- Areas of water in depressions

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Windbreaks and Environmental Plantings” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Jamestown Series

Taxonomic classification: Fine-loamy, mixed, superactive, nonacid, mesic Aeric Epiaquepts

Typical Pedon for the Series

Jamestown silt loam, 0 to 1 percent slopes, occasionally flooded, brief duration, in a cultivated field; 860 feet east and 240 feet south of the northwest corner of sec. 26, T. 36 N., R. 4 E.; USGS Wakarusa topographic quadrangle; latitude 41 degrees 32 minutes 45 seconds N. and longitude 86 degrees 2 minutes 10 seconds W.; Elkhart County, Indiana:

Ap1—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; common very fine roots throughout; neutral; abrupt smooth boundary.

Ap2—5 to 11 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine subangular blocky structure; friable; common very fine roots throughout; common very fine, fine, and medium moderate-continuity interstitial and tubular pores; neutral; abrupt smooth boundary.

Bw—11 to 19 inches; brown (10YR 5/3) loam; moderate medium subangular blocky structure; friable; common very fine roots throughout; common very fine and fine moderate-continuity interstitial and tubular pores; common medium distinct yellowish brown (10YR 5/6) masses of iron oxide accumulation in the matrix; many medium distinct grayish brown (10YR 5/2) iron depletions; common medium rounded dark brown (7.5YR 3/2) masses of iron-manganese oxide accumulations throughout; neutral; clear smooth boundary.

Bg1—19 to 28 inches; grayish brown (10YR 5/2) loam; moderate medium subangular blocky structure; friable; common very fine roots throughout; common very fine and fine moderate-continuity interstitial and tubular pores; many medium distinct dark yellowish brown (10YR 4/4) and common medium distinct yellowish brown (10YR 5/8) masses of iron oxide accumulation in the matrix; common medium rounded dark brown (7.5YR 3/2) masses of iron-manganese oxide accumulation throughout; neutral; clear smooth boundary.

Bg2—28 to 33 inches; grayish brown (10YR 5/2) loam; moderate medium subangular blocky structure; friable; common very fine and fine moderate-continuity tubular pores; many medium distinct yellowish brown (10YR 5/8) masses of iron oxide accumulation in the matrix; common medium rounded dark brown (7.5YR 3/2) masses of iron-manganese oxide accumulation throughout; neutral; clear wavy boundary.

2BC1—33 to 44 inches; dark yellowish brown (10YR 4/4) sandy loam; weak coarse subangular blocky structure; friable; common very fine and fine moderate-continuity tubular pores; common medium distinct yellowish brown (10YR 5/6) masses of iron oxide accumulation in the matrix; common medium distinct grayish brown (10YR 5/2) and brown (10YR 5/3) iron depletions in the matrix; common medium rounded dark brown (7.5YR 3/2) masses of iron-manganese oxide accumulation throughout; neutral; clear wavy boundary.

2BC2—44 to 52 inches; brown (10YR 5/3) loamy sand; weak coarse subangular blocky structure; very friable; common medium distinct grayish brown (10YR 5/2) iron depletions in the matrix; 6 percent gravel; neutral; clear wavy boundary.

3Cd—52 to 68 inches; brown (10YR 5/3) loam; massive; very firm; many medium distinct yellowish brown (10YR 5/4) masses of iron oxide accumulation in the matrix; 2 percent gravel; slightly effervescent; slightly alkaline; clear wavy boundary.

3Cdg—68 to 80 inches; gray (N 5/0) loam; massive; very firm; common medium faint greenish gray (10Y 5/1) iron depletions in the matrix; 2 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics for MLRA 111

Depth to the base of the cambic horizon: 40 to more than 70 inches

Ap or A horizon:

Color—hue of 10YR, value of 3 or 4 (6 or more dry), and chroma of 2 or 3

Reaction—slightly acid or neutral

Bw horizon:
Color—hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 3 or 4
Texture—silt loam, loam, or silty clay loam
Reaction—slightly acid or neutral

Bg horizon:
Color—hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2
Texture—silt loam, loam, or silty clay loam
Reaction—slightly acid or neutral

2BC or 2BCg horizon:
Color—hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 to 6
Texture—dominantly loamy sand or sandy loam; fine sandy loam, fine sand, sand, or sandy clay loam in some pedons
Content of rock fragments—0 to 10 percent
Reaction—slightly acid to slightly alkaline

3C, 3Cg, 3Cd, or 3Cdg horizon:
Color—hue of 10YR, 2.5Y, 5Y, or N, value of 5 or 6, and chroma of 0 to 6
Texture—loam or fine sandy loam
Content of rock fragments—0 to 10 percent
Reaction—slightly alkaline or moderately alkaline

JaaAK—Jamestown silt loam, 0 to 1 percent slopes, occasionally flooded, brief duration

Setting

Landform: Flood plains
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Alluvium over till
Drainage class: Somewhat poorly drained
Available water capacity: High (about 9.1 inches in the upper 60 inches)

Composition

Jamestown soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
- Soils that have a darker surface layer than that of the Jamestown soil
- Soils that have more sand and less clay in the subsoil than the Jamestown soil
- Soils that do not have a till substratum

Contrasting inclusions:
- Southwest soils in natural drainageways
- Soils in which the water table is closer to the surface than that in the Jamestown soil
- Brookston soils in depressions and on flats

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Kimmell Series

Taxonomic classification: Fine, illitic, mesic Aeric Epiaqualfs

Typical Pedon for the Series

Kimmell loam, 0 to 2 percent slopes (fig. 6), in a cultivated field; 2,525 feet south and 125 feet west of the northeast corner of sec. 36, T. 36 N., R. 7 E.; USGS Millersburg topographic quadrangle; latitude 41 degrees 31 minutes 50 seconds N. and longitude 85 degrees 39 minutes 19 seconds W.; Elkhart County, Indiana:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure parting to moderate medium granular; friable; common very fine and fine roots throughout; 1 percent gravel; neutral; abrupt smooth boundary.

E—8 to 12 inches; brown (10YR 5/3) loam; moderate fine subangular blocky structure; friable; common very fine roots throughout; many very fine and fine moderate-continuity interstitial and tubular pores; common fine distinct yellowish brown (10YR 5/6) masses of iron oxide accumulation in the matrix; many fine faint grayish brown (10YR 5/2) iron depletions; 1 percent gravel; neutral; clear wavy boundary.

Bt1—12 to 22 inches; brown (10YR 5/3) clay loam; moderate fine subangular blocky structure (approximately 10 percent is angular blocky); firm; common very fine roots throughout; common very fine and fine low-continuity interstitial and tubular pores; many distinct continuous gray (10YR 5/1) clay films on faces of peds and in pores; common medium distinct yellowish brown (10YR 5/6) masses of iron oxide accumulation in the matrix; many medium faint grayish brown (10YR 5/2) iron

depletions throughout; 1 percent gravel; neutral; clear wavy boundary.

Bt2—22 to 32 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure; firm; common very fine roots throughout; common very fine and fine low-continuity interstitial and tubular pores; many distinct continuous gray (10YR 5/1) clay films on faces of peds and in pores; few medium irregular dark gray (10YR 4/1) soft clay bodies in cracks; common medium distinct yellowish brown (10YR 5/6) masses of iron oxide accumulation in the matrix; many medium faint grayish brown (10YR 5/2) iron depletions; 1 percent gravel; neutral; clear wavy boundary.

Bt3—32 to 37 inches; dark yellowish brown (10YR 4/4) clay loam; weak coarse subangular blocky structure; firm; common very fine roots throughout; common very fine and fine low-continuity interstitial and tubular pores; common distinct continuous gray (10YR 5/1) clay films on faces of peds and in pores; common fine irregular gray (10YR 6/1) masses of carbonates throughout and few medium irregular dark gray (10YR 4/1) soft clay bodies in cracks; common medium distinct yellowish brown (10YR 5/6) masses of iron oxide accumulation in the matrix; many medium distinct grayish brown (10YR 5/2) iron depletions throughout; 1 percent gravel; slightly effervescent; slightly alkaline; clear wavy boundary.

Cd1—37 to 43 inches; yellowish brown (10YR 5/4) clay loam; weak coarse prismatic structure; prisms range from 2 to 5 inches in diameter; very firm; common very fine roots in cracks; many prominent continuous gray (10YR 6/1) carbonate coats on vertical faces of peds; few medium irregular white (10YR 8/1) masses of carbonates in cracks; common medium distinct yellowish brown (10YR 5/6) masses of iron oxide accumulation in the matrix; common medium distinct grayish brown (10YR 5/2) iron depletions throughout; 1 percent gravel; strongly effervescent; moderately alkaline; clear wavy boundary.

Cd2—43 to 53 inches; yellowish brown (10YR 5/4) clay loam; weak very coarse prismatic structure; prisms range from 5 to 15 inches in diameter; very firm; common very fine roots in cracks; many prominent continuous gray (10YR 6/1) carbonate coats on vertical faces of peds; few medium irregular white (10YR 8/1) masses of carbonates in cracks; common medium distinct yellowish brown (10YR 5/6) masses of iron oxide accumulation in the matrix; 1 percent gravel; strongly effervescent; moderately alkaline; clear wavy boundary.

Cd3—53 to 64 inches; yellowish brown (10YR 5/4) clay loam; weak very coarse prismatic structure; prisms range from 5 to 15 inches in diameter; very firm; many prominent continuous gray (10YR 6/1) carbonate coats on bottoms of plates; few medium irregular white (10YR 8/1) masses of carbonates in cracks; common medium distinct yellowish brown (10YR 5/6) masses of iron oxide accumulation in the matrix; 1 percent gravel; strongly effervescent; moderately alkaline; clear wavy boundary.

Cd4—64 to 75 inches; yellowish brown (10YR 5/4) clay loam; massive; very firm; very few prominent continuous gray (10YR 6/1) carbonate coats on bottoms of plates; few medium irregular white (10YR 8/1) masses of carbonates in cracks; common medium distinct yellowish brown (10YR 5/6) masses of iron oxide accumulation in the matrix; 1 percent gravel; strongly effervescent; moderately alkaline; abrupt wavy boundary.

2C—75 to 100 inches; brown (10YR 5/3) fine sand and sand; single grain; loose; strongly effervescent; moderately alkaline.

Range in Characteristics for MLRA 111

Depth to the base of the argillic horizon: 30 to 60 inches
Depth to sand and gravel: 60 to more than 100 inches
Depth to free carbonates: 26 to 60 inches

Ap horizon:
Color—hue of 10YR, value of 3 or 4 (6 or more dry), and chroma of 1 to 3
Content of rock fragments—0 to 5 percent
Reaction—moderately acid to neutral

BE, EB, or E horizon (if it occurs):
Color—hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 to 3
Content of rock fragments—0 to 5 percent
Reaction—moderately acid to neutral

Bt or Btk horizon:
Color—hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4; common or many redoximorphic features
Texture—silty clay loam, clay loam, clay, or silty clay
Content of rock fragments—0 to 5 percent
Reaction—moderately acid or slightly acid in the upper part and slightly acid to moderately alkaline in the lower part

Cd horizon:
Color—hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 3 to 6
Texture—silty clay loam or clay loam
Content of rock fragments—0 to 5 percent
Reaction—slightly alkaline or moderately alkaline

2C horizon:
Color—hue of 10YR, value of 4 to 6, and chroma of 3 to 6
Texture—fine sand, sand, or gravelly coarse sand
Content of rock fragments—0 to 30 percent
Reaction—slightly alkaline or moderately alkaline

KimA—Kimmell loam, 0 to 2 percent slopes

Setting

Landform: Till plains
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Till over outwash
Drainage class: Somewhat poorly drained
Available water capacity: Moderate (about 5.4 inches in the upper 60 inches)

Composition

Kimmell soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
- Soils that are better drained than the Kimmell soil
- Soils that have more sand and less clay in the upper part of the subsoil than the Kimmell soil
- Soils that are sand and gravelly sand more than 120 inches deep

Contrasting inclusions:
- Brady soils on the lower swells
- Cosperville soils on the higher swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Madaus Series

Taxonomic classification: Coarse-silty over sandy or sandy-skeletal, carbonatic over mixed, mesic Histic Humaquepts

Typical Pedon for MLRA 98

Madaus muck, drained, 0 to 1 percent slopes (fig. 7), in a cultivated field; 90 feet south and 600 feet west of the northeast corner of sec. 7, T. 37 N., R. 6 E.; USGS Bristol topographic quadrangle; latitude 41 degrees 40 minutes 53 seconds N. and longitude 85 degrees 52 minutes 23 seconds W.; Elkhart County, Indiana:

Op—0 to 9 inches; muck, black (N 2/0) broken face and rubbed; moderate fine granular structure; very friable; common very fine and fine roots throughout; about 1 percent fiber, less than 1 percent rubbed; 1 percent shell fragments; slightly effervescent; slightly alkaline; abrupt smooth boundary.

Lca1—9 to 13 inches; gray (5Y 6/1) marl; massive; friable; common very fine and fine roots throughout; common very fine and fine moderate-continuity interstitial and tubular pores; about 1 percent fiber, less than 1 percent rubbed; 3 percent shell fragments; common fine irregular dark reddish brown (5YR 3/4) soft masses of iron oxide accumulation in root channels; violently effervescent; moderately alkaline; clear smooth boundary.

Lca2—13 to 31 inches; light yellowish brown (10YR 6/4) marl; massive; friable; common very fine and fine roots throughout; common very fine and fine moderate-continuity interstitial and tubular pores; about 1 percent fiber, less than 1 percent rubbed; 3 percent shell fragments; common medium distinct gray (10YR 6/1) cylindrical iron depletions in cracks; violently effervescent; moderately alkaline; clear smooth boundary.

Lca3—31 to 48 inches; gray (10YR 6/1) marl; massive; friable; common very fine and fine moderate-continuity interstitial and tubular pores; about 1 percent fiber, less than 1 percent rubbed; 1 percent shell fragments; violently effervescent; moderately alkaline; clear smooth boundary.

Lca4—48 to 80 inches; dark gray (5Y 4/1) sand and coarse sand; single grain; loose; 5 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics for MLRA 98

Thickness of the organic material: 8 to 16 inches
Depth to sand and gravel: 40 to 80 inches

Figure 4.—Profile of Bainter sandy loam, 0 to 1 percent slopes, showing tongues of the darker subsoil material extending into the substratum.

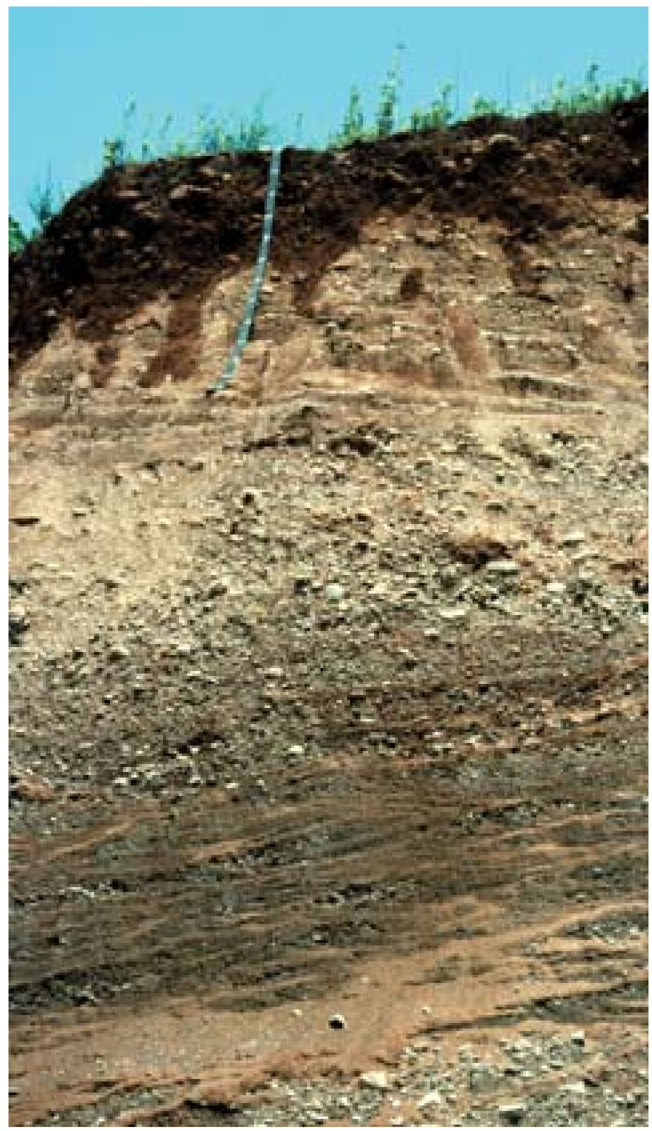

Figure 5.—Profile of Desker sandy loam and the underlying stratified sand and gravel on the side of a gravel pit. The Desker soils are probable sources of sand and gravel.

Figure 6.—Profile of Kimmell loam, 0 to 2 percent slopes.

Figure 7.—Profile of Madaus muck, drained, 0 to 1 percent slopes, showing a thin layer of muck over marl.

Figure 8.—Profile of Oshtemo fine sandy loam.

Op horizon:
Color—hue of 5YR to 10YR or N, value of 2 or 3, and chroma of 0 to 2
Reaction—slightly acid to moderately alkaline

Lca horizon:
Color—hue of 10YR to 5Y or N, value of 4 to 8, and chroma of 0 to 4
Reaction—slightly alkaline or moderately alkaline

2Lca horizon:
Color—hue of 10YR to 5Y or N, value of 4 to 8, and chroma of 0 to 2
Texture—loamy sand, sand, or coarse sand
Reaction—slightly alkaline or moderately alkaline

MfrAN—Madaus muck, drained, 0 to 1 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Depressions

Soil Properties and Qualities

Parent material: Organic material over marl over outwash
Drainage class: Very poorly drained
Available water capacity: Low (about 4.5 inches in the upper 60 inches)

Composition

Madaus soil and similar inclusions: 95 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
- Edwards and Muskego soils in the deeper depressions
- Soils that have a layer of muck more than 16 inches thick

Contrasting inclusions:
- Adrian soils in the shallower depressions and natural drainageways
- Gilford soils in the shallower depressions and natural drainageways and on flats
- Houghton soils in the shallower depressions

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Matherton Series

Taxonomic classification: Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Udollic Endoaqualfs

Typical Pedon for MLRA 98

Matherton loam, 0 to 1 percent slopes, in a cultivated field; 880 feet east and 290 feet south of the northwest corner of sec. 34, T. 35 N., R. 7 E.; USGS Wawasee topographic quadrangle; latitude 41 degrees 27 minutes 0 seconds N. and longitude 85 degrees 42 minutes 34 seconds W.; Elkhart County, Indiana:

Ap—0 to 9 inches; dark brown (10YR 3/3) loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; common fine and medium roots throughout; common fine moderate-continuity interstitial and tubular pores; 3 percent gravel; neutral; abrupt smooth boundary.

Bt1—9 to 19 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure; firm; common fine and medium roots throughout; common fine low-continuity interstitial and tubular pores; common distinct continuous gray (10YR 5/1) clay films on faces of peds; common medium distinct yellowish brown (10YR 5/6) masses of iron oxide accumulation throughout; common medium distinct grayish brown (10YR 5/2) iron depletions throughout; few distinct continuous dark brown (10YR 3/3) organic coats on faces of peds; 10 percent gravel; neutral; clear wavy boundary.

Bt2—19 to 27 inches; brown (10YR 5/3) sandy clay loam; moderate medium subangular blocky structure; friable; common fine and medium roots throughout; common fine and medium low-continuity interstitial and tubular pores; common distinct continuous gray (10YR 5/1) clay films on faces of peds; few prominent discontinuous dark yellowish brown (10YR 4/6) iron-manganese oxide stains throughout; many medium distinct yellowish brown (10YR 5/6) masses of iron oxide accumulation throughout; many medium faint grayish brown (10YR 5/2) iron depletions throughout; 5 percent gravel; neutral; clear wavy boundary.

Bt3—27 to 34 inches; dark brown (10YR 3/3) sandy clay loam; moderate medium subangular blocky

structure; firm; common fine and medium roots throughout; common fine low-continuity interstitial and tubular pores; many faint continuous very dark grayish brown (10YR 3/2) clay films on faces of peds; very few distinct continuous dark yellowish brown (10YR 4/6) manganese oxide or iron-manganese oxide stains on faces of peds; 12 percent gravel; neutral; clear wavy boundary.

2C—34 to 40 inches; brown (10YR 5/3) sand; weak coarse subangular blocky structure; very friable; common fine and medium roots throughout; few distinct continuous dark yellowish brown (10YR 4/6) and very few prominent continuous yellowish brown (10YR 5/8) manganese oxide or iron-manganese oxide stains on faces of peds; 3 percent gravel; strongly effervescent; slightly alkaline; clear wavy boundary.

2Cg—40 to 49 inches; light brownish gray (10YR 6/2) coarse sand and sand; single grain; loose; few distinct continuous dark yellowish brown (10YR 4/6) manganese oxide or iron-manganese oxide stains on faces of peds; 1 percent gravel; strongly effervescent; slightly alkaline; clear wavy boundary.

2C´—49 to 70 inches; brown (10YR 5/3) very gravelly coarse sand, sand, and coarse sand; single grain; loose; few distinct continuous dark yellowish brown (10YR 4/6) manganese oxide or iron-manganese oxide stains on faces of peds; 40 percent gravel; 2 percent black (N 2/0) organic-rich shale; strongly effervescent; slightly alkaline; clear wavy boundary.

2C´g—70 to 80 inches; gray (10YR 5/1) very gravelly coarse sand, sand, and coarse sand; single grain; loose; 40 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics for MLRA 98

Thickness of the A horizon: 6 to 10 inches
Depth to the base of the argillic horizon: 24 to 40 inches
Depth to sand and gravel: 24 to 40 inches

Ap horizon:
Color—hue of 10YR, value of 2 or 3, and chroma of 1 to 3
Content of rock fragments—0 to 14 percent
Reaction—moderately acid to neutral

E or Eg horizon (if it occurs):
Color—hue of 10YR, value of 5 or 6, and chroma of 2
Texture—sandy loam, loam, silt loam, or the gravelly analogs of these textures
Content of rock fragments—0 to 20 percent
Reaction—moderately acid to neutral

Bt, Btg, 2Bt, or 2Btg horizon:
Color—hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 2 to 4
Texture—sandy clay loam, clay loam, loam, or the gravelly analogs of these textures
Content of rock fragments—2 to 30 percent
Reaction—strongly acid to neutral

2C, 2Cg, 3C, or 3Cg horizon:
Color—hue of 7.5YR to 2.5Y, value of 4 to 7, and chroma of 1 to 4
Texture—sand, coarse sand, or the gravelly or very gravelly analogs of these textures; fine sand in some pedons
Content of rock fragments—1 to 60 percent
Reaction—slightly alkaline or moderately alkaline

MftA—Matherton loam, 0 to 1 percent slopes

Setting

Landform: Outwash plains and outwash terraces
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Somewhat poorly drained
Available water capacity: Moderate (about 6.1 inches in the upper 60 inches)

Composition

Matherton soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
• Soils that are better drained than the Matherton soil
• Soils that have more sand and less clay in the surface layer and subsoil than the Matherton soil
• Soils that have a thicker solum than that of the Matherton soil
Contrasting inclusions:
• Sebewa soils in depressions and natural drainageways and on flats

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

• “Agronomy” section

- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Maumee Series

Taxonomic classification: Sandy, mixed, mesic Typic Endoaquolls

Typical Pedon for the Series

Maumee loamy sand, 0 to 1 percent slopes, in a cultivated field; 700 feet north and 160 feet east of the southwest corner of sec. 32, T. 33 N., R. 5 W.; Porter County, Indiana:

Ap—0 to 10 inches; black (10YR 2/1) loamy sand, dark gray (10YR 4/1) dry; weak medium granular structure; very friable; few fine and medium roots; neutral; abrupt smooth boundary.

A—10 to 23 inches; very dark gray (10YR 3/1) loamy sand, gray (10YR 5/1) dry; weak coarse subangular blocky structure; very friable; few fine roots; few fine distinct dark yellowish brown (10YR 3/6) masses of iron oxide accumulation in the matrix; common coarse distinct dark grayish brown (10YR 4/2) iron depletions in the matrix; neutral; clear wavy boundary.

Bg1—23 to 32 inches; grayish brown (10YR 5/2) sand; single grain; loose; few fine roots; few fine distinct dark yellowish brown (10YR 4/6) masses of iron oxide accumulation in the matrix; common coarse distinct dark gray (10YR 4/1) and very dark gray (10YR 3/1) iron depletions in the matrix; neutral; clear wavy boundary.

Bg2—32 to 38 inches; grayish brown (10YR 5/2) sand; single grain; loose; few fine roots; common medium distinct yellowish brown (10YR 5/4) and few medium distinct dark yellowish brown (10YR 4/6) masses of iron oxide accumulation in the matrix; neutral; abrupt wavy boundary.

Cg—38 to 60 inches; light brownish gray (10YR 6/2) fine sand; single grain; loose; common medium distinct brownish yellow (10YR 6/6) masses of iron oxide accumulation in the matrix; neutral.

Range in Characteristics for MLRA 98

Thickness of the mollic epipedon: 15 to 24 inches
Depth to free carbonates: 40 or more inches

Ap and A horizons:
Color—hue of 10YR or N, value of 2 or 3, and chroma of 0 to 2
Content of rock fragments—0 to 5 percent
Reaction—moderately acid to slightly alkaline

Bg horizon:
Color—hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 or less
Texture—sand, fine sand, loamy sand, or loamy fine sand
Content of rock fragments—0 to 5 percent
Reaction—moderately acid to neutral

Cg horizon:
Color—hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 or less; chroma of 3 or less below a depth of 40 inches
Texture—sand, fine sand, loamy sand, loamy fine sand, or coarse sand
Content of rock fragments—0 to 15 percent
Reaction—moderately acid to moderately alkaline above a depth of 40 inches and slightly acid to moderately alkaline below that depth

MgcA—Maumee loamy sand, 0 to 1 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Depressions and flats

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Very poorly drained
Available water capacity: Low (about 5.1 inches in the upper 60 inches)

Composition

Maumee soil and similar inclusions: 95 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
- Soils that have more clay in the surface layer and subsoil than the Maumee soil
- Soils that have a surface layer of mucky loamy sand
- Soils that have a thinner surface layer than that of the Maumee soil

Contrasting inclusions:
- Morocco soils on swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Metea Series

Taxonomic classification: Loamy, mixed, active, mesic Arenic Hapludalfs

Typical Pedon for the Series

Metea loamy fine sand, on a slope of 4 percent in a cultivated field; 1,600 feet west and 700 feet south of the center of sec. 25, T. 33 N., R. 1 E.; Marshall County, Indiana:

Ap—0 to 9 inches; dark brown (10YR 4/3) loamy fine sand, light yellowish brown (10YR 6/4) dry; weak fine granular structure; very friable; moderately acid; abrupt smooth boundary.

E—9 to 28 inches; yellowish brown (10YR 5/4) fine sand; single grain; loose; moderately acid; abrupt smooth boundary.

Bt1—28 to 32 inches; yellowish brown (10YR 5/4) sandy loam, very pale brown (10YR 7/4) dry; weak medium subangular blocky structure; friable; common brown (10YR 4/3) clay bridges between sand grains; 3 percent gravel; moderately acid; clear wavy boundary.

2Bt2—32 to 44 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; friable; thin discontinuous brown (10YR 4/3) clay films on faces of peds; 4 percent gravel; moderately acid; clear wavy boundary.

2C—44 to 60 inches; brown (10YR 5/3) loam; massive; friable; strongly effervescent; moderately alkaline.

Range in Characteristics for MLRA 111

Depth to the base of the argillic horizon and thickness of the solum: 40 to 60 inches

Ap horizon:
Color—hue of 10YR, value of 3 to 5, and chroma of 2 to 4
Texture—loamy fine sand or loamy sand
Reaction—moderately acid to neutral

E horizon:
Color—hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6
Texture—loamy sand, loamy fine sand, sand, or fine sand
Reaction—strongly acid to slightly acid

Bt horizon:
Color—hue of 10YR, value and chroma of 4 to 6
Texture—sandy loam, fine sandy loam, or sandy clay loam
Content of rock fragments—0 to 5 percent
Reaction—moderately acid or slightly acid

2Bt horizon:
Color—hue of 10YR, value of 4 or 5, and chroma of 3 to 8
Texture—clay loam or loam
Content of rock fragments—1 to 10 percent
Reaction—moderately acid or slightly acid; neutral in the lower part in pedons that have more than one subhorizon

2C horizon:
Color—hue of 10YR, value of 5 or 6, and chroma of 3 to 8
Content of rock fragments—0 to 14 percent
Reaction—slightly alkaline or moderately alkaline

Miami Series

Taxonomic classification: Fine-loamy, mixed, active, mesic Oxyaquic Hapludalfs

Typical Pedon for the Series

Miami silt loam, 1 to 5 percent slopes, in a cultivated field; 800 feet west and 300 feet south of the northeast corner of sec. 6, T. 15 N., R. 1 E.; Hendricks County, Indiana:

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

Bt1—8 to 13 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine subangular blocky structure; firm; thick continuous dark brown (7.5YR 4/4) clay films on faces of peds and occurring as linings of some voids; 1 percent pebbles; moderately acid; abrupt wavy boundary.

2Bt2—13 to 23 inches; dark yellowish brown (10YR 4/4) clay loam; strong coarse subangular blocky structure; firm; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds and occurring as linings of some voids; 2 percent pebbles; strongly acid; clear wavy boundary.

2Bt3—23 to 31 inches; dark yellowish brown (10YR 4/4) clay loam; moderate coarse subangular blocky structure; firm; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds and occurring as linings of some voids; common fine and medium rounded very dark gray (10YR 3/1) masses of iron-manganese accumulation in the

matrix; 5 percent pebbles; moderately acid; clear wavy boundary.

2BC—31 to 36 inches; dark brown (10YR 4/3) loam; weak coarse prismatic structure; friable; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; common fine and medium irregular very dark gray (10YR 3/1) masses of iron-manganese accumulation in the matrix; common medium distinct light brownish gray (10YR 6/2) irregularly shaped iron depletions in the matrix; 5 percent pebbles; slightly effervescent; slightly alkaline; clear irregular boundary.

2Cd—36 to 80 inches; brown (10YR 5/3) loam; massive; very firm; few fine irregular very dark gray (10YR 3/1) masses of iron-manganese accumulation in the matrix; common medium distinct grayish brown (10YR 5/2) irregularly shaped iron depletions in the matrix; 5 percent pebbles; strongly effervescent; moderately alkaline.

Range in Characteristics for MLRA 111

Depth to the base of the argillic horizon: 24 to 40 inches
Depth to free carbonates: 20 to 40 inches

Ap horizon:
Color—hue of 10YR (moist or dry), value of 3 to 5 (6 dry), and chroma of 1 to 4 (2 or 3 dry)
Texture—loam, silt loam, or clay loam
Content of rock fragments—0 to 3 percent
Reaction—moderately acid to neutral

Bt and 2Bt horizons:
Color—hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6
Texture—silty clay loam or clay loam in the upper part and clay loam in the lower part; 15 to 40 percent sand in the 2Bt horizon
Content of rock fragments—1 to 10 percent pebbles
Reaction—strongly acid to slightly acid in the upper part and moderately acid to neutral in the lower part

BC or 2BC horizon:
Color—hue of 7.5YR, 10YR, or 2.5Y, value of 4 to 6, and chroma of 3 or 4
Content of rock fragments—1 to 10 percent
Reaction—neutral or slightly alkaline

Cd or 2Cd horizon:
Color—hue of 7.5YR, 10YR, or 2.5Y, value of 5 or 6, and chroma of 3 or 4
Texture—loam or fine sandy loam
Content of rock fragments—1 to 10 percent pebbles
Reaction—slightly alkaline or moderately alkaline

MmdC2—Miami loam, 5 to 10 percent slopes, eroded

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders

Soil Properties and Qualities

Parent material: Glacial till
Drainage class: Moderately well drained
Available water capacity: High (about 3.7 inches in the upper 60 inches)

Composition

Miami soil and similar inclusions: 75 percent
Contrasting inclusions: 25 percent

Inclusions

Similar inclusions:
- Soils that are less sloping than the Miami soil
- Soils that are severely eroded
- Soils that have a substratum of stratified sand
- Soils that have a thicker or thinner solum than that of the Miami soil

Contrasting inclusions:
- Metea soils on backslopes and shoulders
- Soils that are more sloping than the Miami soil
- Williamstown soils on swells and backslopes

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

MmdC3—Miami clay loam, 5 to 10 percent slopes, severely eroded

Setting

Landform: Moraines
Position on the landform: Backslopes and shoulders

Soil Properties and Qualities

Parent material: Glacial till
Drainage class: Moderately well drained
Available water capacity: Moderate (about 3.6 inches in the upper 60 inches)

Composition

Miami soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Inclusions

Similar inclusions:
- Soils that are less sloping than the Miami soil
- Soils that have a substratum of stratified sand
- Soils that have a thicker or thinner solum than that of the Miami soil

Contrasting inclusions:
- Metea soils on backslopes and shoulders
- Soils that are more sloping than the Miami soil
- Williamstown soils on swells and backslopes

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

MmdD2—Miami loam, 10 to 18 percent slopes, eroded

Setting

Landform: Moraines
Position on the landform: Backslopes

Soil Properties and Qualities

Parent material: Glacial till
Drainage class: Moderately well drained
Available water capacity: Moderate (about 3.7 inches in the upper 60 inches)

Composition

Miami soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Inclusions

Similar inclusions:
- Soils that are less sloping than the Miami soil
- Soils that are severely eroded
- Soils that have a substratum of stratified sand
- Soils that have a thicker or thinner solum than that of the Miami soil

Contrasting inclusions:
- Metea soils on backslopes and shoulders
- Soils that are more sloping than the Miami soil
- Williamstown soils on swells and backslopes

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

MmdD3—Miami clay loam, 10 to 18 percent slopes, severely eroded

Setting

Landform: Moraines
Position on the landform: Backslopes

Soil Properties and Qualities

Parent material: Glacial till
Drainage class: Moderately well drained
Available water capacity: Moderate (about 3.6 inches in the upper 60 inches)

Composition

Miami soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Inclusions

Similar inclusions:
- Soils that are less sloping than the Miami soil
- Soils that have a substratum of stratified sand
- Soils that have a thicker or thinner solum than that of the Miami soil

Contrasting inclusions:
- Metea soils on backslopes and shoulders
- Soils that are more sloping than the Miami soil
- Williamstown soils on swells and backslopes

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Milford Series

Taxonomic classification: Fine, mixed, superactive, mesic Typic Endoaquolls

Typical Pedon for MLRA 111

Milford silty clay loam, 0 to 2 percent slopes, in a cultivated field; 920 feet south and 225 feet east of the center of sec. 4, T. 34 N., R. 11 E.; Noble County, Indiana:

Ap—0 to 7 inches; very dark gray (10YR 3/1) silty clay loam, grayish brown (2.5Y 5/2) dry; moderate very fine angular blocky and subangular blocky structure; firm; many roots; neutral; abrupt smooth boundary.

AB—7 to 11 inches; very dark gray (10YR 3/1) silty clay, grayish brown (2.5Y 5/2) dry; moderate very fine angular blocky and subangular blocky structure; firm; many roots; neutral; clear smooth boundary.

Bg1—11 to 16 inches; dark gray (10YR 4/1) silty clay loam; moderate fine and medium angular blocky structure; very firm; few roots; thin very dark gray (10YR 3/1) organic coats on faces of peds; neutral; clear smooth boundary.

Bg2—16 to 26 inches; dark gray (10YR 4/1) silty clay; moderate medium and coarse angular blocky structure; very firm; common very fine and fine roots throughout; common fine prominent reddish brown (5YR 4/4) and few fine distinct yellowish brown (10YR 5/4) masses of iron oxide accumulation; thin very dark gray (10YR 3/1) organic coatings on some faces of peds; few iron-manganese oxide concretions; neutral; gradual smooth boundary.

Bg3—26 to 33 inches; dark gray (5Y 4/1) silty clay; moderate medium and coarse prismatic structure parting to moderate medium and coarse angular blocky; very firm; common fine distinct yellowish brown (10YR 4/4) masses of iron oxide accumulation; few thin dark gray (5Y 4/1) organic coats on vertical faces of peds; neutral; gradual smooth boundary.

Bg4—33 to 44 inches; gray (5Y 5/1) silty clay; moderate medium and coarse prismatic structure parting to moderate medium and coarse angular blocky; very firm; few fine prominent reddish brown (5Y 4/4) and many fine prominent brown (7.5YR 4/4) masses of iron oxide accumulation; few iron-manganese oxide concretions; neutral; gradual smooth boundary.

Bg5—44 to 49 inches; gray (5Y 5/1) silty clay; weak medium and coarse prismatic structure parting to moderate coarse angular blocky and subangular blocky; very firm; common fine distinct yellowish brown (10YR 5/4) masses of iron oxide accumulation; neutral; gradual smooth boundary.

Cg—49 to 63 inches; gray (5Y 5/1) silty clay loam with thin strata of silt loam, sandy loam, and silty clay; massive; friable; few fine distinct yellowish brown (10YR 5/4) masses of iron oxide accumulation; strongly effervescent; slightly alkaline.

Range in Characteristics for MLRA 111

Thickness of the mollic epipedon: 11 to 15 inches
Depth to the base of the cambic horizon: 40 to 55 inches

Ap, A, or AB horizon:
Color—hue of 10YR to 5Y or N, value of 2 or 3 (3 to 5 dry), and chroma of 0 to 2
Texture—silty clay loam or clay loam
Content of rock fragments—0 to 5 percent
Reaction—moderately acid to neutral

Bg horizon:
Color—hue of 10YR to 5Y or N, value of 4 to 6, and chroma of 0 to 2
Texture—silty clay loam or silty clay
Content of rock fragments—0 to 5 percent
Reaction—moderately acid to neutral in the upper part and neutral or slightly alkaline in the lower part

C horizon:
Color—hue of 10YR to 5Y or N, value of 5, and chroma of 0 to 2
Texture—clay loam or silty clay loam; thin strata ranging from clay to sandy loam in some pedons
Content of rock fragments—0 to 5 percent
Reaction—slightly alkaline or moderately alkaline

MouAN—Milford silty clay loam, 0 to 1 percent slopes

Setting

Landform: Lake plains
Position on the landform: Depressions, natural drainageways, and flats

Soil Properties and Qualities

Parent material: Lacustrine deposits
Drainage class: Very poorly drained
Available water capacity: High (about 10.5 inches in the upper 60 inches)

Composition

Milford soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
• Soils that have less clay in the subsoil than the Milford soil
Contrasting inclusions:
• Crosier and Del Rey soils on swells
• Rensselaer soils in depressions and natural drainageways and on flats

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Agronomy" section
- "Forestland" section
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" section
- "Soil Properties" section

Mishawaka Series

Taxonomic classification: Sandy, mixed, mesic Typic Hapludolls

Typical Pedon for the Series

Mishawaka sandy loam, 0 to 1 percent slopes, in a cultivated field; 1,590 feet east and 2,490 feet north of the southwest corner of sec. 26, T. 38 N., R. 6 E.; USGS Bristol topographic quadrangle; latitude 41 degrees 43 minutes 3.1 seconds N. and longitude 85 degrees 48 minutes 24.8 seconds W.; Elkhart County, Indiana:

Ap—0 to 12 inches; very dark brown (10YR 2/2) sandy loam, very dark grayish brown (10YR 3/2) dry; weak fine granular structure; very friable; common fine and medium roots throughout; moderately acid; abrupt smooth boundary.

2Bt1—12 to 18 inches; dark brown (7.5YR 3/3) sandy loam, brown (10YR 4/3) dry; moderate medium subangular blocky structure; very friable; many medium and coarse and common fine roots throughout; few faint patchy very dark grayish brown (10YR 3/2) clay films on faces of peds and on sand and gravel; 14 percent gravel; strongly acid; clear wavy boundary.

2Bt2—18 to 25 inches; brown (7.5YR 4/3) gravelly loamy sand; weak fine subangular blocky structure; very friable; many medium and coarse and common fine roots throughout; few faint patchy dark brown (10YR 3/3) clay films on faces of peds and on sand and gravel; 31 percent gravel; very strongly acid; clear wavy boundary.

3BC—25 to 32 inches; dark yellowish brown (10YR 4/4) sand; weak fine subangular blocky structure; very friable; many coarse and common medium roots throughout; 1 percent gravel; strongly acid; gradual wavy boundary.

3C1—32 to 58 inches; yellowish brown (10YR 5/4) sand; single grain; loose; common coarse, medium, and fine roots throughout; 1 percent gravel; strongly acid; gradual wavy boundary.

3C2—58 to 70 inches; brown (10YR 5/3) sand; single grain; loose; common coarse, medium, and fine roots throughout; 3 percent gravel; strongly acid; gradual wavy boundary.

3C3—70 to 80 inches; brown (10YR 5/3) coarse sand; single grain; loose; common coarse, medium, and fine roots throughout; 5 percent gravel; strongly acid.

Range in Characteristics for MLRA 98

Thickness of the mollic epipedon: 10 to 20 inches
Depth to the C horizon: 40 to 70 inches

A or Ap horizon:
Color—hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 to 3
Content of rock fragments—0 to 15 percent
Reaction—strongly acid to neutral

2Bt horizon:
Color—hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 3 or 4
Texture—sandy loam, loamy sand, gravelly sandy loam, or gravelly loamy sand
Content of rock fragments—0 to 35 percent
Reaction—strongly acid or moderately acid

3BC horizon:
Color—hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 4 or 5
Texture—sand or fine sand
Content of rock fragments—0 to 15 percent
Reaction—strongly acid or moderately acid

3C horizon:
Color—hue of 10YR, value of 5, and chroma of 3 or 4
Texture—coarse sand or sand
Content of rock fragments—0 to 15 percent
Reaction—strongly acid or moderately acid

MsaA—Mishawaka sandy loam, 0 to 1 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Excessively drained
Available water capacity: Low (about 5.9 inches in the upper 60 inches)

Composition

Mishawaka soil and similar inclusions: 95 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
• Soils that have more clay in the subsoil than the Mishawaka soil
Contrasting inclusions:
• Soils in which the water table is closer to the surface than that in the Mishawaka soil

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Morocco Series

Taxonomic classification: Mixed, mesic Aquic Udipsamments

Typical Pedon for the Series

Morocco loamy fine sand, on a slope of 0.5 percent, in a cultivated field; 270 feet north and 950 feet west of the southeast corner of sec. 7, T. 31 N., R. 7 W.; Jasper County, Indiana:

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) loamy fine sand, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; common fine and very fine roots; very strongly acid; abrupt smooth boundary.
Bw1—9 to 14 inches; light yellowish brown (10YR 6/4) loamy fine sand, very pale brown (10YR 7/4) dry; single grain; loose; few very fine roots; few fine prominent strong brown (10YR 5/8) masses of iron oxide accumulation in the matrix; common medium distinct light gray (10YR 7/2) iron depletions in the matrix; very strongly acid; clear wavy boundary.
Bw2—14 to 22 inches; very pale brown (10YR 7/3) loamy fine sand; single grain; loose; few very fine roots; common medium prominent brownish yellow (10YR 6/8) masses of iron oxide accumulation in the matrix; very strongly acid; clear wavy boundary.
Bg—22 to 35 inches; light gray (10YR 7/2) fine sand; single grain; loose; many coarse prominent yellowish red (10YR 5/8) masses of iron oxide accumulation in the matrix; very strongly acid; clear wavy boundary.
C1—35 to 50 inches; very pale brown (10YR 7/4) fine sand; single grain; loose; common medium prominent brownish yellow (10YR 6/8) masses of iron oxide accumulation in the matrix; common medium distinct light gray (10YR 7/2) iron depletions in the matrix: very strongly acid; gradual wavy boundary.
C2—50 to 60 inches; very pale brown (10YR 7/4) fine sand; single grain; loose; common medium prominent brownish yellow (10YR 6/8) masses of iron oxide accumulation in the matrix; common medium distinct light gray (10YR 7/2) iron depletions in the matrix; strongly acid.

Range in Characteristics for MLRA 98

Depth to redoximorphic features: Less than 15 inches
Depth to the C horizon: 24 to 48 inches

A or Ap horizon:
Color—hue of 10YR, value of 3 to 6, and chroma of 1 to 3
Texture—loamy fine sand, fine sand, loamy sand, or sand
Content of rock fragments—0 to 1 percent
Reaction—very strongly acid to moderately acid; very strongly acid to neutral in areas that have been limed

E or Eg horizon:
Color—hue of 10YR, value of 4 to 6, and chroma of 2 to 6
Texture—loamy fine sand, fine sand, loamy sand, or sand
Content of rock fragments—0 to 1 percent
Reaction—very strongly acid to moderately acid; very strongly acid to neutral in areas that have been limed

Bw or Bg horizon:
Color—hue of 5YR, 7.5YR, 10YR, or 2.5Y, value of 4 to 7, and chroma of 1 to 8
Texture—loamy sand, fine sand, or sand
Content of rock fragments—0 to 5 percent
Reaction—very strongly acid to moderately acid

C or Cg horizon:
Color—hue of 2.5YR, 5YR, 7.5YR, or 10YR, value of 5 to 8, and chroma of 1 to 8
Texture—fine sand or sand
Content of rock fragments—0 to 7 percent
Reaction—very strongly acid to moderately acid

MvkA—Morocco loamy sand, 0 to 1 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Somewhat poorly drained
Available water capacity: Low (about 4.8 inches in the upper 60 inches)

Composition

Morocco soil and similar inclusions: 95 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
- Soils that are better drained than the Morocco soil
- Soils that have more clay in the subsoil than the Morocco soil
- Soils that have neutral reaction in the subsoil
- Soils that have a thicker surface layer than that of the Morocco soil

Contrasting inclusions:
- Adrian soils in depressions and natural drainageways
- Maumee soils in depressions and on flats

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Muskego Series

Taxonomic classification: Coprogenous, euic, mesic Limnic Haplosaprists

Typical Pedon for MLRA 111

Muskego muck, drained, 0 to 1 percent slopes, in a cultivated field; 2,507 feet south and 275 feet west of the northeast corner of sec. 6, T. 36 N., R. 5 E.; USGS Foraker topographic quadrangle; latitude 41 degrees 36 minutes 7 seconds N. and longitude 85 degrees 59 minutes 5 seconds W; Elkhart County, Indiana:

Op—0 to 9 inches; muck, black (N 2/0) broken face and rubbed; about 5 percent fiber, less than 1 percent rubbed; moderate fine granular structure; very friable; many very fine and fine roots throughout; slightly acid; abrupt smooth boundary.

Oa1—9 to 21 inches; muck, brown (7.5YR 4/4) broken face, black (N 2/0) after exposure to air; about 5 percent fiber, less than 1 percent rubbed; moderate thin platy structure; very firm; common very fine and fine roots between peds; slightly acid; clear smooth boundary.

Oa2—21 to 27 inches; muck, dark gray (10YR 4/1) broken face, black (N 2/0) after exposure to air; about 15 percent fiber unrubbed, 2 percent rubbed; weak thin platy structure; friable; common very fine and fine roots between peds; slightly acid; clear smooth boundary.

Lco1—27 to 35 inches; weak red (2.5Y 4/2) coprogenous earth; about 5 percent fiber, 5 percent rubbed; massive; very friable; neutral; clear smooth boundary.

Lco2—35 to 54 inches; dark grayish brown (2.5Y 4/2) coprogenous earth; massive; very friable; neutral; clear smooth boundary.

Lco3—54 to 70 inches; olive gray (5Y 4/2) coprogenous earth, dark gray (5Y 4/1) after exposure to air; massive; very friable; neutral; clear smooth boundary.

Lco4—70 to 80 inches; dark gray (5Y 4/1) coprogenous earth; massive; very friable; neutral.

Range in Characteristics for MLRA 111

Depth to coprogenous earth: 16 to 51 inches

Op horizon:
Color—hue of 10YR or N, value of 2, and chroma of 0 to 2
Reaction—moderately acid to neutral

Oa horizon:
Color—hue of 7.5YR, 10YR, or N, value of 2 or 3, and chroma of 0 to 3
Reaction—moderately acid to neutral

Lco horizon:
Color—hue of 10YR, 2.5Y, or 5Y, value of 2 to 4, and chroma of 1 to 3
Reaction—neutral to moderately alkaline

MwzAN—Muskego muck, drained, 0 to 1 percent slopes

Setting

Landform: Till plains and outwash plains
Position on the landform: Depressions

Soil Properties and Qualities

Parent material: Organic over coprogenic materials
Drainage class: Very poorly drained
Available water capacity: Very high (about 17.6 inches in the upper 60 inches)

Composition

Muskego soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
• Soils that have marl in the substratum
• Soils that have a sandy substratum
Contrasting inclusions:
• Adrian soils in the shallower depressions and natural drainageways on outwash plains
• Houghton soils in the shallower depressions
• Palms soils in the shallower depressions on till plains

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

• “Agronomy” section
• “Forestland” section
• “Recreation” section
• “Wildlife Habitat” section
• “Engineering” section
• “Soil Properties” section

MwzAU—Muskego muck, undrained, 0 to 1 percent slopes

Setting

Landform: Till plains and outwash plains
Position on the landform: Depressions

Soil Properties and Qualities

Parent material: Organic over coprogenic materials
Drainage class: Very poorly drained
Available water capacity: Very high (about 17.6 inches in the upper 60 inches)

Composition

Muskego soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
• Soils that have marl in the substratum
• Soils that have a sandy substratum
Contrasting inclusions:
• Adrian soils in the shallower depressions and natural drainageways on outwash plains
• Houghton soils in the shallower depressions
• Palms soils in the shallower depressions on till plains

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

• “Windbreaks and Environmental Plantings” section
• “Forestland” section
• “Recreation” section
• “Wildlife Habitat” section
• “Engineering” section
• “Soil Properties” section

Oshtemo Series

Taxonomic classification: Coarse-loamy, mixed, active, mesic Typic Hapludalfs

Typical Pedon for MLRA 111

Oshtemo fine sandy loam (fig. 8), 1 to 5 percent

slopes, in a cultivated field; 2,240 feet north and 300 feet east of the southwest corner of sec. 26, T. 36 N., R. 5 E.; USGS Foraker topographic quadrangle; latitude 41 degrees 32 minutes 34 seconds N. and longitude 85 degrees 55 minutes 24 seconds W.; Elkhart County, Indiana:

Ap—0 to 9 inches; brown (10YR 4/3) fine sandy loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; few very fine and fine roots throughout; 5 percent gravel; neutral; abrupt smooth boundary.

E/Bt—9 to 15 inches; 60 percent brown (10YR 5/3) fine sandy loam, very pale brown (10YR 7/3) dry (E); 40 percent dark yellowish brown (10YR 4/4) fine sandy loam (Bt); moderate medium subangular blocky structure; friable; few very fine roots throughout; common very fine and fine interstitial and tubular pores; few faint continuous brown (10YR 4/3) organic coats on faces of peds and in pores; 5 percent gravel; neutral; clear wavy boundary.

Bt/E1—15 to 22 inches; 60 percent brown (7.5YR 4/4) fine sandy loam; common faint discontinuous brown (7.5YR 4/3) clay films on faces of peds and in pores (Bt); 40 percent brown (10YR 4/3) loamy sand, very pale brown (10YR 7/3) dry (E); moderate medium subangular blocky structure; friable; few very fine roots throughout; few very fine interstitial and tubular pores; few faint continuous brown (10YR 4/3) organic coats on faces of peds and in pores; 2 percent gravel; neutral; clear wavy boundary.

Bt/E2—22 to 32 inches; 75 percent brown (7.5YR 4/4) sandy loam; friable (Bt); 25 percent dark yellowish brown (10YR 4/6) loamy sand; very friable (E); weak coarse subangular blocky structure; few very fine roots throughout; few very fine interstitial and tubular pores; few faint continuous brown (10YR 4/3) organic coats on faces of peds and in pores; 5 percent gravel; neutral; clear wavy boundary.

E/B´t—32 to 46 inches; 75 percent dark yellowish brown (10YR 4/6) and 5 percent brown (10YR 5/3) loamy sand; weak coarse and fine subangular blocky structure; very friable (E); 20 percent dark brown (7.5YR 3/4) sandy loam; weak thick platy structure; friable (Bt); few very fine roots throughout; very few faint continuous brown (10YR 4/3) organic coats on faces of peds and in pores; 4 percent gravel; neutral; clear wavy boundary.

2Bt—46 to 62 inches; dark brown (7.5YR 3/3) very gravelly coarse sandy loam; weak coarse subangular blocky structure; friable; few faint discontinuous brown (10YR 4/3) clay films between sand grains; 42 percent gravel and 5 percent cobbles; neutral; abrupt wavy boundary.

3C—62 to 80 inches; dark yellowish brown (10YR 4/4) very gravelly coarse sand; single grain; loose; 50 percent gravel and 3 percent cobbles; strongly effervescent; slightly alkaline.

Range in Characteristics for MLRA 111

Depth to the base of the argillic horizon: 40 to 75 inches
Depth to sand and gravel: 40 to 75 inches
Depth to free carbonates: 40 to 70 inches

Ap horizon:
Color—hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 or 3
Content of rock fragments—1 to 14 percent
Reaction—strongly acid to neutral

E part of Bt/E or E/Bt horizon (if it occurs):
Color—hue of 10YR, value of 4 to 6, and chroma of 3 to 6
Texture—sandy loam, fine sandy loam, or loamy sand
Content of rock fragments—1 to 14 percent
Reaction—strongly acid to neutral

Bt part of Bt/E or E/Bt horizon (if it occurs):
Color—hue of 5YR, 7.5YR, or 10YR, value of 3 to 5, and chroma of 3 to 6
Texture—sandy loam, fine sandy loam, or loamy sand
Content of rock fragments—1 to 14 percent
Reaction—strongly acid to neutral

2Bt horizon:
Color—hue of 5YR, 7.5YR, or 10YR, value of 3 to 5, and chroma of 3 to 6
Texture—coarse sandy loam, sandy loam, sandy clay loam, or the gravelly or very gravelly analogs of these textures
Content of rock fragments—5 to 50 percent gravel and 0 to 5 percent cobbles
Reaction—strongly acid to neutral

3C horizon:
Color—hue of 10YR, value of 4 to 6, and chroma of 3 to 6
Texture—sand, coarse sand, gravelly sand, or gravelly coarse sand
Content of rock fragments—10 to 50 percent gravel and 0 to 5 percent cobbles
Reaction—slightly alkaline or moderately alkaline

Osolo Series

Taxonomic classification: Mixed, mesic Typic Udipsamments

Typical Pedon for the Series

Osolo loamy sand, 0 to 1 percent slopes, in a cultivated field; 2,583 feet west and 1,666 feet south of the northeast corner of sec. 24, T. 38 N., R. 5 E.; USGS Elkhart topographic quadrangle; latitude 41 degrees 44 minutes 4 seconds N. and longitude 85 degrees 53 minutes 23 seconds W.; Elkhart County, Indiana:

Ap—0 to 9 inches; dark brown (10YR 3/3) loamy sand, pale brown (10YR 6/3) dry; weak fine granular structure; very friable; common very fine and fine roots; 1 percent gravel; slightly acid; abrupt smooth boundary.

Bw1—9 to 15 inches; brown (7.5YR 4/4) loamy sand; weak fine subangular blocky structure; very friable; few very fine and fine roots; 1 percent gravel; slightly acid; clear wavy boundary.

Bw2—15 to 20 inches; brown (7.5YR 4/4) loamy sand; weak fine subangular blocky structure; very friable; few very fine and fine roots; 1 percent gravel; neutral; clear wavy boundary.

Bw3—20 to 25 inches; brown (7.5YR 4/4) loamy sand; weak fine subangular blocky structure; very friable; few very fine and fine roots; 2 percent gravel; slightly acid; clear wavy boundary.

Bw4—25 to 29 inches; brown (7.5YR 4/4) sand; single grain; loose; slightly acid; clear wavy boundary.

Bw5—29 to 40 inches; dark yellowish brown (10YR 4/6) sand; single grain; loose; slightly acid; clear wavy boundary.

BC1—40 to 48 inches; yellowish brown (10YR 5/4) fine sand; single grain; loose; few medium faint pale brown (10YR 6/3) iron depletions in the matrix; slightly acid; clear wavy boundary.

BC2—48 to 66 inches; light yellowish brown (10YR 6/4) fine sand; single grain; loose; many medium distinct strong brown (7.5YR 4/6) masses of iron oxide accumulations in the matrix; many medium distinct light brownish gray (10YR 6/2) iron depletions in the matrix; slightly acid; clear wavy boundary.

BC3—66 to 80 inches; yellowish brown (10YR 5/4) fine sand; single grain; loose; many medium distinct light brownish gray (10YR 6/2) iron depletions in the matrix; slightly acid.

Range in Characteristics for MLRA 98

Depth to redoximorphic features: 40 to more than 72 inches
Depth to sand: 20 to 50 inches

A or Ap horizon:
Color—hue of 10YR, value of 3 or 4, and chroma of 2 to 4
Content of rock fragments—0 to 10 percent
Reaction—strongly acid to neutral

Bw horizon:
Color—hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6
Texture—loamy sand in the upper part and sand or fine sand in the lower part
Content of rock fragments—0 to 10 percent
Reaction—strongly acid to neutral

BC or C horizon (if it occurs):
Color—hue of 10YR, value of 4 to 6, and chroma of 3 to 6
Texture—sand or fine sand
Content of rock fragments—0 to 10 percent
Reaction—strongly acid to neutral

OmgA—Osolo loamy sand, 0 to 1 percent slopes

Setting

Landform: Outwash plains and outwash terraces
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Well drained
Available water capacity: Low (about 5.0 inches in the upper 60 inches)

Composition

Osolo soil and similar inclusions: 95 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
- Soils that are better drained than the Osolo soil
- Soils that have lamellae in the subsoil
- Soils that have more clay in the subsoil than the Osolo soil

Contrasting inclusions:
- Brems soils on the lower swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section (fig. 9)
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

OmgB—Osolo loamy sand, 1 to 5 percent slopes

Setting

Landform: Outwash plains and outwash terraces
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Well drained
Available water capacity: Low (about 5.0 inches in the upper 60 inches)

Composition

Osolo soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
- Soils that are better drained than the Osolo soil
- Soils that have lamellae in the subsoil
- Soils that have more clay in the subsoil than the Osolo soil

Contrasting inclusions:
- Brems soils on the lower swells

Figure 9.—Drought-stressed corn in an area of Osolo loamy sand, 0 to 1 percent slopes.

• Gilford soils in depressions and natural drainageways and on flats
• Morocco soils on the lower swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

• "Agronomy" section
• "Forestland" section
• "Recreation" section
• "Wildlife Habitat" section
• "Engineering" section
• "Soil Properties" section

Palms Series

Taxonomic classification: Loamy, mixed, euic, mesic Terric Haplosaprists

Typical Pedon for MLRA 111

Palms muck, drained, 0 to 1 percent slopes, in a cultivated field; 1,550 feet south and 2,350 feet west of the northeast corner of sec. 15, T. 36 N., R. 5 E.; USGS Foraker topographic quadrangle; latitude 41 degrees 34 minutes 33 seconds N. and longitude 85 degrees 56 minutes 2 seconds W.; Elkhart County, Indiana:

Op—0 to 10 inches; muck, black (N 2/0) broken face and rubbed; moderate fine granular structure; very friable; common fine and medium roots throughout; common very fine and fine moderate-continuity interstitial and tubular pores; about 3 percent fiber, less than 1 percent rubbed; neutral; abrupt smooth boundary.

Oa1—10 to 16 inches; muck, black (N 2/0) broken face and rubbed; moderate fine subangular blocky structure; very friable; common fine and medium roots throughout; common fine and medium moderate-continuity interstitial and tubular pores; about 3 percent fiber, less than 1 percent rubbed; slightly acid; clear wavy boundary.

Oa2—16 to 22 inches; muck, black (N 2/0) broken face and rubbed; moderate coarse subangular blocky structure; very friable; common fine and medium roots throughout; common fine and medium moderate-continuity interstitial and tubular pores; about 12 percent fiber, 6 percent rubbed; neutral; clear wavy boundary.

Oa3—22 to 35 inches; muck, black (N 2/0) broken face and rubbed; moderate coarse subangular blocky structure; very friable; common fine and medium roots throughout; common fine and medium moderate-continuity interstitial and tubular pores; about 15 percent fiber, 8 percent rubbed; neutral; abrupt wavy boundary.

Cg1—35 to 43 inches; dark gray (5Y 4/1) silty clay loam; massive; firm; common very fine and fine roots throughout; common very fine and fine moderate-continuity interstitial and tubular pores; many medium prominent dark yellowish brown (10YR 4/4) masses of iron oxide accumulation; neutral; clear wavy boundary.

Cg2—43 to 62 inches; gray (5Y 5/1) silt loam; massive; firm; common very fine and fine roots throughout; common very fine and fine moderate-continuity interstitial and tubular pores; slightly effervescent; slightly alkaline; gradual smooth boundary.

Cg3—62 to 80 inches; dark gray (5Y 4/1) silty clay loam; massive; firm; slightly effervescent; slightly alkaline.

Range in Characteristics for MLRA 111

Op horizon:
Color—hue of 5YR, 10YR, or N, value of 2 or 3, and chroma of 0 to 2
Reaction—strongly acid to slightly alkaline

Oa horizon:
Color—hue of 5YR, 10YR, or N, value of 2 to 4, and chroma of 0 to 3
Reaction—strongly acid to slightly alkaline

C or Cg horizon:
Color—hue of 10YR, 2.5Y, 5Y, 5GY, or N, value of 3 to 7, and chroma of 0 to 4
Texture—loamy very fine sand, sandy loam, fine sandy loam, loam, silt loam, silty clay loam, clay loam, sandy clay loam, or the gravelly analogs of these textures
Content of rock fragments—0 to 25 percent
Reaction—slightly acid to moderately alkaline

PaaAN—Palms muck, drained, 0 to 1 percent slopes

Setting

Landform: Outwash plains and till plains
Position on the landform: Depressions

Soil Properties and Qualities

Parent material: Organic deposits over glacial deposits
Drainage class: Very poorly drained
Available water capacity: Very high (about 18.3 inches in the upper 60 inches)

Composition

Palms soil and similar inclusions: 75 percent
Contrasting inclusions: 25 percent

Inclusions

Similar inclusions:
• Soils that have a substratum of loamy sand or sand
• Soils that have organic deposits more than 51 inches thick
Contrasting inclusions:
• Muskego soils in the deeper depressions
• Sebewa soils in the shallower depressions and natural drainageways and on flats

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

• “Agronomy” section
• “Forestland” section
• “Recreation” section
• “Wildlife Habitat” section
• “Engineering” section
• “Soil Properties” section

Pewamo Series

Taxonomic classification: Fine, mixed, active, mesic Typic Argiaquolls

Typical Pedon for the Series

Pewamo clay loam, 0 to 1 percent slopes, in a cultivated field; 100 feet south and 300 feet west of the northeast corner of sec. 26, T. 2 S., R. 7 E.; Washtenaw County, Michigan:

Ap—0 to 10 inches; very dark brown (10YR 2/2) clay loam, grayish brown (10YR 5/2) dry; weak medium granular structure; firm; about 3 percent gravel; slightly acid; abrupt smooth boundary.
A—10 to 13 inches; very dark brown (10YR 2/2) clay loam, grayish brown (10YR 5/2) dry; weak medium angular blocky structure; firm; about 3 percent gravel; slightly acid; gradual wavy boundary.
Btg1—13 to 25 inches; dark gray (10YR 4/1) silty clay; moderate medium angular blocky structure; firm; continuous thin clay films on faces of peds; common medium prominent strong brown (7.5YR 5/6) masses of iron oxide accumulation in the matrix; common medium faint very dark gray (10YR 3/1) iron depletions in the matrix; about 2 percent gravel; slightly acid; gradual wavy boundary.
Btg2—25 to 37 inches; gray (10YR 5/1) silty clay; moderate medium angular blocky structure; firm; discontinuous thin clay films on faces of peds; common medium distinct yellowish brown (10YR 5/6) masses of iron oxide accumulation in the matrix; common medium faint gray (N 5/0) iron depletions in the matrix; about 2 percent gravel; neutral; gradual wavy boundary.
Cg—37 to 60 inches; grayish brown (10YR 5/2) silty clay loam; massive; firm; common medium distinct brownish yellow (10YR 6/6) masses of iron oxide accumulation in the matrix; common medium faint gray (10YR 6/1) iron depletions in the matrix; about 4 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics for MLRA 111

Thickness of the mollic epipedon: 10 to 15 inches
Depth to free carbonates: 28 to 60 inches

A or Ap horizon:
Color—hue of 10YR, value of 2 or 3, and chroma of 1 or 2
Content of rock fragments—0 to 10 percent
Reaction—slightly acid or neutral

Btg or Bt horizon:
Color—hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 to 4
Texture—clay loam, clay, silty clay, or silty clay loam
Content of rock fragments—0 to 10 percent
Reaction—moderately acid to slightly alkaline

Cg horizon:
Color—hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 to 4
Texture—clay loam or silty clay loam
Content of rock fragments—0 to 10 percent
Reaction—slightly alkaline or moderately alkaline

PkdA—Pewamo clay loam, 0 to 1 percent slopes

Setting

Landform: Moraines
Position on the landform: Depressions and natural drainageways

Soil Properties and Qualities

Parent material: Glacial till
Drainage class: Very poorly drained

Available water capacity: Moderate (about 9.3 inches in the upper 60 inches)

Composition

Pewamo soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
- Soils that have more sand and less clay in the surface layer and in the upper part of the subsoil than the Pewamo soil
- Soils that have a thinner surface layer than that of the Pewamo soil

Contrasting inclusions:
- Blount soils on swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Pmg—Pits, gravel

General Description

- This map unit consists of excavations and filled-in areas. Generally, these areas consist of mixed, sandy soil materials.

Setting

Landform: Outwash plains and till plains
Position on the landform: Variable

Soil Properties and Qualities

Parent material: Outwash or glacial till
Drainage class: Well drained to very poorly drained
Available water capacity: Very low (probably less than 3.5 inches in the upper 60 inches)

Composition

Gravel pits and similar inclusions: 95 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
- Loamy materials

Contrasting inclusions:
- Piles of overburden
- Areas of exposed till
- Areas of water in excavations

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Windbreaks and Environmental Plantings” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Rensselaer Series

Taxonomic classification: Fine-loamy, mixed, superactive, mesic Typic Argiaquolls

Typical Pedon for the Series

Rensselaer loam, 0 to 1 percent slopes, in a cultivated field 3 miles east and 1.5 miles north of Bourbon, Indiana; 1,150 feet east and 380 feet north of the southwest corner of sec. 9, T. 33 N., R. 4 E.; Marshall County, Indiana:

Ap—0 to 11 inches; very dark gray (10YR 3/1) loam, gray (10YR 5/1) dry; moderate fine granular structure; friable; common fine roots throughout; neutral; clear smooth boundary.

A—11 to 15 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; friable; common fine roots throughout; common fine distinct dark brown (10YR 4/3) masses of iron oxide accumulation in the matrix; neutral; clear wavy boundary.

Btg1—15 to 26 inches; dark gray (10YR 4/1) clay loam; moderate medium subangular blocky structure; firm; few fine roots throughout; many distinct discontinuous very dark gray (10YR 3/1) organic and clay films on faces of peds; few fine prominent yellowish red (5YR 5/8) masses of iron oxide accumulation in the matrix; slightly acid; clear wavy boundary.

Btg2—26 to 38 inches; gray (10YR 6/1) clay loam; moderate medium subangular blocky structure; firm; few fine roots throughout; many distinct discontinuous dark gray (10YR 4/1) clay films on faces of peds; common medium prominent yellowish red (5YR 5/8) and strong brown (7.5YR

5/8) masses of iron oxide accumulation in the matrix; neutral; clear wavy boundary.

Btg3—38 to 42 inches; gray (10YR 5/1) loam; moderate medium subangular blocky structure; friable; few fine and very fine roots throughout; common distinct patchy dark gray (10YR 4/1) clay films on faces of peds; common medium prominent yellowish brown (10YR 5/8) masses of iron oxide accumulation in the matrix; slightly effervescent; slightly alkaline; clear wavy boundary.

Cg—42 to 60 inches; gray (10YR 6/1) silt loam with thin strata of fine sand; massive; friable; few medium prominent brownish yellow (10YR 6/8) masses of iron oxide accumulation in the matrix; 10 percent fine gravel; strongly effervescent; moderately alkaline.

Range in Characteristics for MLRA 111

Thickness of the mollic epipedon: 10 to 14 inches
Depth to the base of the argillic horizon: 30 to 60 inches
Depth to till: 40 to 80 inches

A or Ap horizon:
Color—hue of 10YR, value of 2 or 3, and chroma of 1 or 2
Content of rock fragments—1 to 5 percent
Reaction—slightly acid or neutral

Btg horizon:
Color—hue of 10YR, value of 4 or 5, and chroma of 1 or 2
Texture—silty clay loam, loam, or clay loam in the upper part and loam, sandy clay loam, clay loam, silt loam, or sandy loam in the lower part
Content of rock fragments—0 to 5 percent
Reaction—slightly acid or neutral

BC or BCg horizon (if it occurs):
Color—hue of 10YR, value of 5 or 6, and chroma of 1 to 4
Texture—sandy loam, loamy sand, coarse sandy loam, coarse loamy sand, gravelly coarse sandy loam, or gravelly coarse loamy sand
Content of rock fragments—0 to 14 percent
Reaction—neutral or slightly alkaline

Cg horizon:
Color—hue of 10YR, value of 5 or 6, and chroma of 1 or 2
Texture—fine sand, very fine sand, sand, loamy sand, loamy fine sand, sandy loam, loam, or silt loam
Content of rock fragments—0 to 14 percent
Reaction—slightly alkaline or moderately alkaline

2Cg horizon (if it occurs):
Color—hue of 10YR, value of 4 or 5, and chroma of 1 to 4
Texture—fine sandy loam or loam
Content of rock fragments—0 to 14 percent
Reaction—slightly alkaline or moderately alkaline

ReyAN—Rensselaer loam, 0 to 1 percent slopes

Setting

Landform: Till plains
Position on the landform: Depressions, natural drainageways, and flats

Soil Properties and Qualities

Parent material: Outwash over till
Drainage class: Poorly drained
Available water capacity: High (about 10.4 inches in the upper 60 inches)

Composition

Rensselaer soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Inclusions

Similar inclusions:
• Soils that have less sand and more clay in the solum than the Rensselaer soil
• Soils that do not have strata of sand
• Soils that have not been drained
Contrasting inclusions:
• Gilford soils in the deeper depressions and natural drainageways and on flats
• Baugo soils on swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Riddles Series

Taxonomic classification: Fine-loamy, mixed, active, mesic Typic Hapludalfs

Typical Pedon for the Series

Riddles fine sandy loam, 1 to 5 percent slopes, in a cultivated field; 2,550 feet south and 500 feet east of the northwest corner of sec. 26, T. 36 N., R. 5 E.; USGS Foraker topographic quadrangle; latitude 41 degrees 32 minutes 39 seconds N. and longitude 85 degrees 55 minutes 23 seconds W.; Elkhart County, Indiana:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) fine sandy loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many fine and medium roots throughout; many very fine to medium interstitial and tubular pores; 7 percent gravel; slightly acid; abrupt wavy boundary.

Bt1—8 to 13 inches; brown (7.5YR 4/3) sandy clay loam; moderate fine and medium subangular blocky structure; firm; few fine and medium roots throughout; many fine interstitial and tubular pores; many faint patchy brown (10YR 4/3) clay films on faces of peds; common distinct brown (10YR 5/3) silt coats on faces of peds; 8 percent gravel; neutral; clear wavy boundary.

Bt2—13 to 20 inches; brown (10YR 4/3) clay loam; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine and medium roots throughout; many fine interstitial and tubular pores; many faint continuous dark grayish brown (10YR 4/2) clay films on faces of peds; common faint brown (10YR 5/3) silt coats on faces of peds; 3 percent gravel; slightly acid; clear wavy boundary.

Bt3—20 to 33 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure; firm; few fine and medium roots throughout; many fine interstitial and tubular pores; many faint continuous brown (10YR 4/3) clay films on faces of peds; many faint brown (10YR 5/3) silt coats on faces of peds; common medium faint yellowish brown (10YR 5/8) masses of iron oxide accumulation in the matrix; 7 percent gravel; moderately acid; gradual wavy boundary.

Bt4—33 to 46 inches; dark yellowish brown (10YR 4/4) fine sandy loam; moderate coarse subangular blocky structure; very firm; few fine roots throughout; many fine interstitial and tubular pores; many faint continuous brown (10YR 4/3) clay films on faces of peds; few fine faint yellowish brown (10YR 5/8) and few fine distinct brown (10YR 5/3) masses of iron oxide accumulation in the matrix; 7 percent gravel; neutral; gradual wavy boundary.

Bt5—46 to 55 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak coarse subangular blocky structure; firm; few very fine roots throughout; many fine interstitial and tubular pores; many faint patchy brown (10YR 4/3) clay films on faces of peds; few fine faint yellowish brown (10YR 5/8) masses of iron oxide accumulation in the matrix; few fine distinct brown (10YR 5/3) iron depletions; 7 percent gravel; 1 percent cobbles; moderately acid; gradual wavy boundary.

Bt6—55 to 63 inches; dark yellowish brown (10YR 4/4) sandy loam; weak coarse subangular blocky structure; firm; few very fine roots throughout; many fine interstitial and tubular pores; many faint patchy brown (10YR 4/3) clay films on faces of peds; 5 percent gravel; moderately acid; clear wavy boundary.

2Bt&E—63 to 70 inches; brown (10YR 4/3) sandy loam (Bt) occurring as lamellae 1 to 1.25 inches thick with a combined thickness of 4 inches; weak thick platy structure; very friable; few very fine roots throughout; few very fine interstitial and tubular pores; common distinct continuous brown (10YR 4/3) clay bridges between sand grains; 5 percent gravel; moderately acid; yellowish brown (10YR 5/4) sand (E); weak medium subangular blocky structure; very friable; few very fine roots throughout; few very fine interstitial and tubular pores; 5 percent gravel; moderately acid; gradual wavy boundary.

2E&Bt—70 to 78 inches; yellowish brown (10YR 5/4) loamy sand (E); weak medium subangular blocky structure; very friable; few very fine roots throughout; few very fine interstitial and tubular pores; 5 percent gravel; slightly acid; brown (10YR 4/3) loamy sand (Bt) occurring as lamellae 1 to 1.5 inches thick with a combined thickness of 2 inches; weak thick platy structure; very friable; common distinct continuous brown (10YR 4/3) clay bridges between sand grains; few very fine roots throughout; few very fine interstitial and tubular pores; 5 percent gravel; slightly acid; clear wavy boundary.

2Bt/E—78 to 90 inches; 85 percent dark yellowish brown (10YR 4/4) loamy sand (Bt); weak thin platy structure; very friable; few very fine interstitial and tubular pores; 3 percent gravel; slightly acid; 15 percent light yellowish brown (10YR 6/4) sand (E); single grain; loose; few very fine interstitial and tubular pores; 3 percent gravel; slightly acid; clear wavy boundary.

3C—90 to 100 inches; yellowish brown (10YR 5/4) fine sandy loam with pockets of sand; weak thin platy structure; firm; 5 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics for MLRA 111

Depth to the base of the argillic horizon: 40 to 95 inches
Depth to free carbonates: 40 to 90 inches

Ap or A horizon:
Color—hue of 10YR, value of 3 to 5, and chroma of 2 to 4
Content of rock fragments—1 to 14 percent
Reaction—moderately acid to neutral

E horizon (if it occurs):
Color—hue of 10YR, value of 5 or 6, and chroma of 2 to 4
Texture—loam, sandy loam, or fine sandy loam
Content of rock fragments—1 to 14 percent
Reaction—moderately acid to neutral

Bt horizon:
Color—hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6
Texture—sandy clay loam, clay loam, sandy loam, or loam; the range includes fine sandy loam or sandy loam in the lower part
Content of rock fragments—1 to 14 percent
Reaction—strongly acid to neutral

Bt part of 2Bt, 2Bt&E, 2E&Bt, or 2Bt/E horizon (if it occurs):
Colors—hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6
Texture—fine sandy loam, sandy loam, loamy sand, or the gravelly analogs of these textures
Content of rock fragments—1 to 34 percent
Reaction—strongly acid to neutral

E part of 2Bt&E, 2E&Bt, or 2Bt/E horizon (if it occurs):
Color—similar to those of the E horizon
Texture—fine sandy loam, sandy loam, loamy sand, sand, or the gravelly analogs of these textures
Content of rock fragments—1 to 34 percent
Reaction—strongly acid to neutral

2C horizon (if it occurs):
Color—hue of 10YR, value of 5 or 6, and chroma of 3 or 4
Texture—sandy loam, loamy sand, sand, or the gravelly analogs of these textures
Content of rock fragments—1 to 34 percent
Reaction—slightly alkaline or moderately alkaline

3C or C horizon (if it occurs):
Color—hue of 10YR, value of 4 to 6, and chroma of 3 or 4
Texture—loam, sandy loam, or fine sandy loam; pockets of sand in some pedons
Content of rock fragments—1 to 14 percent
Reaction—slightly alkaline or moderately alkaline

RopA—Riddles-Oshtemo complex, 0 to 1 percent slopes

Setting

Landform: Riddles—till plains and moraines; Oshtemo—moraines
Position on the landform: Swells

Soil Properties and Qualities

Riddles

Parent material: Glacial till
Drainage class: Well drained
Available water capacity: High (about 8.9 inches in the upper 60 inches)

Oshtemo

Parent material: Outwash
Drainage class: Well drained
Available water capacity: Low (about 7.6 inches in the upper 60 inches)

Composition

Riddles soil and similar inclusions: 70 percent
Oshtemo soil and similar inclusions: 25 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
- Soils that have a surface layer of loam or loamy sand
- Areas southwest of Middlebury in which the soils have thick strata of sand and gravel in the substratum
- Soils that have a thinner solum than that of the Riddles and Oshtemo soils

Contrasting inclusions:
- Metea soils on backslopes and shoulders
- Tyner soils on swells, backslopes, and shoulders
- Williamstown soils on the lower swells and backslopes

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section

- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

RopB—Riddles-Oshtemo complex, 1 to 5 percent slopes

Setting

Landform: Riddles—till plains and moraines; Oshtemo—moraines
Position on the landform: Swells

Soil Properties and Qualities

Riddles

Parent material: Glacial till
Drainage class: Well drained
Available water capacity: High (about 8.9 inches in the upper 60 inches)

Oshtemo

Parent material: Outwash
Drainage class: Well drained
Available water capacity: Low (about 7.6 inches in the upper 60 inches)

Composition

Riddles soil and similar inclusions: 55 percent
Oshtemo soil and similar inclusions: 25 percent
Contrasting inclusions: 20 percent

Inclusions

Similar inclusions:
- Soils that are less sloping than the Riddles and Oshtemo soils
- Soils that have a surface layer of loam or loamy sand
- Soils that have thick strata of sand and gravel in the substratum
- Soils that have a thinner solum than that of the Riddles and Oshtemo soils

Contrasting inclusions:
- Crosier soils on the lower swells
- Metea soils on backslopes and shoulders
- Soils that are more sloping than the Riddles and Oshtemo soils
- Tyner soils on swells, backslopes, and shoulders
- Williamstown soils on the lower swells and backslopes

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

RoqC2—Riddles-Metea complex, 5 to 12 percent slopes, eroded

Setting

Landform: Till plains
Position on the landform: Backslopes and shoulders

Soil Properties and Qualities

Riddles

Parent material: Glacial till
Drainage class: Well drained
Available water capacity: High (about 8.9 inches in the upper 60 inches)

Metea

Parent material: Outwash over till
Drainage class: Well drained
Available water capacity: Moderate (about 7.1 inches in the upper 60 inches)

Composition

Riddles soil and similar inclusions: 55 percent
Metea soil and similar inclusions: 30 percent
Contrasting inclusions: 15 percent

Inclusions

Similar inclusions:
- Soils that are less sloping than the Riddles and Metea soils
- Soils that have a surface layer of loam or loamy sand
- Soils that are severely eroded
- Soils that have stratified sand in the substratum
- Soils that have thick strata of sand and gravel in the substratum; on moraines
- Soils that have a thinner solum than that of the Riddles and Metea soils

Contrasting inclusions:
- Crosier soils on the lower swells
- Soils that are more sloping than the Riddles and Metea soils
- Oshtemo soils on swells

- Tyner soils on swells, backslopes, and shoulders
- Williamstown soils on the lower swells and backslopes

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

RoqD2—Riddles-Metea complex, 12 to 18 percent slopes, eroded

Setting

Landform: Till plains
Position on the landform: Backslopes

Soil Properties and Qualities

Riddles

Parent material: Glacial till
Drainage class: Well drained
Available water capacity: High (about 8.9 inches in the upper 60 inches)

Metea

Parent material: Outwash over till
Drainage class: Well drained
Available water capacity: Moderate (about 7.1 inches in the upper 60 inches)

Composition

Riddles soil and similar inclusions: 60 percent
Metea soil and similar inclusions: 20 percent
Contrasting inclusions: 20 percent

Inclusions

Similar inclusions:
- Soils that have a thinner solum than that of the Riddles and Metea soils

Contrasting inclusions:
- Crosier soils on the lower swells
- Soils that are more sloping than the Riddles and Metea soils
- Oshtemo soils on swells
- Tyner soils on swells, backslopes, and shoulders
- Williamstown soils on the lower swells and backslopes

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Windbreaks and Environmental Plantings” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

RosE—Riddles-Tyner complex, 18 to 30 percent slopes

Setting

Landform: Riddles—till plains and moraines; Tyner—outwash plains
Position on the landform: Backslopes

Soil Properties and Qualities

Riddles

Parent material: Glacial till
Drainage class: Well drained
Available water capacity: High (about 8.9 inches in the upper 60 inches)

Tyner

Parent material: Outwash
Drainage class: Somewhat excessively drained
Available water capacity: Low (about 4.7 inches in the upper 60 inches)

Composition

Riddles soil and similar inclusions: 60 percent
Tyner soil and similar inclusions: 30 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
- Soils that are less sloping than the Riddles and Tyner soils
- Soils that have a surface layer of loam or loamy sand
- Soils that have more clay in the subsoil
- Soils that are severely eroded
- Soils that have thick strata of sand and gravel in the substratum; on moraines
- Soils that have a thinner solum than that of the Riddles and Tyner soils

Contrasting inclusions:
- Crosier soils on the lower swells

- Metea soils on backslopes and shoulders
- Soils that are more sloping than the Riddles and Tyner soils
- Oshtemo soils on swells
- Williamstown soils on the lower swells and backslopes

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Windbreaks and Environmental Plantings” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Sebewa Series

Taxonomic classification: Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Typic Argiaquolls

Typical Pedon for the Series

Sebewa loam, 0 to 1 percent slopes, in a cultivated field; 100 feet south and 700 feet west of the northeast corner of sec. 9, T. 2 N., R. 5 W.; Eaton County, Michigan:

Ap—0 to 11 inches; very dark gray (10YR 3/1) loam, gray (10YR 5/1) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

Bg—11 to 14 inches; dark gray (10YR 4/1) loam; moderate medium granular structure; friable; few fine faint gray (10YR 5/1) iron depletions; very dark grayish brown (10YR 3/2) root channel fillings; neutral; clear wavy boundary.

Btg1—14 to 19 inches; gray (10YR 5/1) sandy clay loam; moderate medium subangular blocky structure; firm; few distinct dark gray (10YR 4/1) clay films on faces of peds; common medium distinct yellowish brown (10YR 5/6) and few medium prominent olive brown (2.5Y 4/4) masses of iron oxide accumulation in the matrix; slightly alkaline; gradual wavy boundary.

Btg2—19 to 31 inches; gray (10YR 5/1) clay loam; moderate medium subangular blocky structure; firm; few distinct dark gray (10YR 4/1) clay films on faces of peds; common medium prominent strong brown (7.5YR 5/6) and few fine prominent light olive brown (2.5Y 5/4) masses of iron oxide accumulation in the matrix; slightly alkaline; abrupt wavy boundary.

2Btg3—31 to 36 inches; gray (10YR 5/1) gravelly clay loam; moderate medium subangular blocky structure; firm; common medium distinct yellowish brown (10YR 5/6) masses of iron oxide accumulation in the matrix; about 15 percent gravel; slightly alkaline; abrupt irregular boundary.

2Cg—36 to 62 inches; gray (10YR 5/1) gravelly sand; single grain; loose; about 15 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics for MLRA 98

Thickness of the mollic epipedon: 8 to 15 inches
Depth to the base of the argillic horizon: 20 to 40 inches
Depth to sand and gravel: 20 to 40 inches
Depth to free carbonates: 18 to 36 inches

A or Ap horizon:
Color—hue of 10YR to 5Y or N, value of 2 or 3, and chroma of 0 to 2
Texture—loam or mucky loam
Content of rock fragments—0 to 15 percent
Reaction—slightly acid to slightly alkaline

Btg, Bg, or 2Btg horizon:
Color—hue of 10YR to 5Y or N, value of 4 to 6, and chroma of 0 to 2
Texture—sandy clay loam, loam, clay loam, or gravelly clay loam
Content of rock fragments—3 to 25 percent
Reaction—slightly acid to slightly alkaline

2C or 2Cg horizon:
Color—hue of 10YR to 5Y, value of 5 or 6, and chroma of 1 to 4
Texture—gravelly sand, very gravelly sand, loamy sand, sand, stratified sand and gravel, gravelly coarse sand, very gravelly coarse sand, or coarse sand
Content of rock fragments—10 to 60 percent
Reaction—slightly alkaline to moderately alkaline

ScuA—Sebewa loam, 0 to 1 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Depressions, natural drainageways, and flats

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Poorly drained
Available water capacity: Moderate (about 7.4 inches in the upper 60 inches)

Composition

Sebewa soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
- Soils that have less clay and more sand in the subsoil than the Sebewa soil
- Soils that have a surface layer of mucky loam
- Soils that have a thicker solum than that of the Sebewa soil

Contrasting inclusions:
- Matherton soils on swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Agronomy" section
- "Forestland" section
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" section
- "Soil Properties" section

SdnA—Sebewa mucky loam, 0 to 1 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Depressions

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Very poorly drained
Available water capacity: Moderate (about 7.5 inches in the upper 60 inches)

Composition

Sebewa soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
- Soils that have less clay and more sand in the subsoil than the Sebewa soil
- Soils that have a thicker solum than that of the Sebewa soil

Contrasting inclusions:
- Adrian soils in the deeper depressions and natural drainageways
- Edwards soils in the deeper depressions
- Matherton soils on swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Agronomy" section
- "Forestland" section
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" section
- "Soil Properties" section

Selfridge Series

Taxonomic classification: Loamy, mixed, active, mesic Aquic Arenic Hapludalfs

Typical Pedon for MLRA 111

Selfridge loamy fine sand, 0 to 1 percent slopes, in a cultivated field; 735 feet west and 60 feet north of the southeast corner of sec. 33, T. 36 N., R. 5 E.; USGS Foraker topographic quadrangle; latitude 41 degrees 31 minutes 19 seconds N. and longitude 85 degrees 56 minutes 47 seconds W.; Elkhart County, Indiana:

Ap—0 to 11 inches; dark brown (10YR 3/3) loamy fine sand, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; common very fine and fine roots throughout; neutral; abrupt smooth boundary.

E1—11 to 15 inches; brown (10YR 5/3) loamy sand, pale brown (10YR 6/3) dry; weak medium subangular blocky structure; friable; common very fine roots throughout; common very fine and fine moderate-continuity interstitial and tubular pores; many medium faint grayish brown (10YR 5/2) iron depletions; neutral; clear wavy boundary.

E2—15 to 23 inches; light yellowish brown (10YR 6/4) loamy sand, very pale brown (10YR 7/3) dry; weak medium subangular blocky structure; friable; common very fine roots throughout; common very fine and fine moderate-continuity interstitial and tubular pores; common medium distinct brownish yellow (10YR 6/6) masses of iron oxide accumulation in the matrix; common medium distinct light brownish gray (10YR 6/2) iron depletions; neutral; clear wavy boundary.

E/2Btg—23 to 27 inches; 80 percent pale brown (10YR 6/3) fine sand; weak medium subangular blocky structure (E); 20 percent gray (10YR 6/1)

silt loam; moderate medium subangular blocky structure (2Btg); friable; common very fine and fine moderate-continuity interstitial and tubular pores; many medium faint light brownish gray (10YR 6/2) iron depletions; neutral; clear wavy boundary.

2Btg—27 to 31 inches; 60 percent gray (10YR 6/1) silty clay loam and 40 percent gray (10YR 6/1) clay loam; moderate medium subangular blocky structure; firm; common very fine and fine low-continuity interstitial and tubular pores; common distinct continuous gray (10YR 5/1) clay films on faces of peds; many medium prominent brownish yellow (10YR 6/8) masses of iron oxide accumulation in the matrix; neutral; clear wavy boundary.

2Bt1—31 to 36 inches; 80 percent dark yellowish brown (10YR 4/4) sandy loam and 20 percent dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure; firm; common very fine and fine low-continuity interstitial and tubular pores; common distinct continuous dark grayish brown (10YR 4/2) clay films on faces of peds; many medium distinct dark grayish brown (10YR 4/2) iron depletions; neutral; clear wavy boundary.

2Bt2—36 to 47 inches; yellowish brown (10YR 5/6) silty clay loam; weak coarse subangular blocky structure; firm; common very fine and fine low-continuity interstitial and tubular pores; few distinct discontinuous gray (10YR 5/1) clay films on faces of peds and in pores; many medium prominent gray (10YR 6/1) iron depletions; neutral; clear wavy boundary.

2C1—47 to 68 inches; yellowish brown (10YR 5/6) silt loam; massive; firm; common very fine and fine low-continuity interstitial and tubular pores; many medium prominent light brownish gray (10YR 6/2) iron depletions; strongly effervescent; slightly alkaline; clear wavy boundary.

2C2—68 to 80 inches; brownish yellow (10YR 6/6) silt loam; massive; friable; common very fine and fine low-continuity interstitial and tubular pores; many medium prominent light brownish gray (10YR 6/2) iron depletions; strongly effervescent; slightly alkaline.

Range in Characteristics for MLRA 111

Depth to the base of the argillic horizon: 30 to 50 inches
Thickness of the sandy material: 20 to 40 inches
Depth to till or lacustrine deposits: 20 to 50 inches

Ap horizon:
Color—hue of 10YR, value of 2 to 4, and chroma of 1 to 3
Content of rock fragments—0 to 5 percent
Reaction—moderately acid to neutral

E or Eg horizon or E part of E/2Btg horizon:
Color—hue of 10YR, value of 2 to 4, and chroma of 1 to 3
Texture—sand, fine sand, loamy sand, or loamy fine sand
Content of rock fragments—0 to 5 percent
Reaction—moderately acid to slightly alkaline

2Bt or 2Btg horizon or 2Btg part of E/2Btg horizon:
Color—hue of 10YR, 7.5YR, or 2.5Y, value of 4 to 6, and chroma of 1 to 6
Texture—sandy loam, sandy clay loam, clay loam, silt loam, silty clay loam, or loam
Content of rock fragments—0 to 10 percent
Reaction—strongly acid to slightly alkaline

2C or Cg horizon:
Color—hue of 5YR, 7.5YR, or 10YR, value of 5 or 6, and chroma of 1 to 6
Texture—loam, silt loam, or silty clay loam
Content of rock fragments—0 to 10 percent
Reaction—neutral or slightly alkaline

SdzA—Selfridge-Crosier complex, 0 to 1 percent slopes

Setting

Landform: Till plains
Position on the landform: Swells

Soil Properties and Qualities

Selfridge

Parent material: Outwash over till
Drainage class: Somewhat poorly drained
Available water capacity: High (about 6.5 inches in the upper 60 inches)

Crosier

Parent material: Glacial till
Drainage class: Somewhat poorly drained
Available water capacity: High (about 7.0 inches in the upper 60 inches)

Composition

Selfridge soil and similar inclusions: 55 percent
Crosier soil and similar inclusions: 35 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
- Soils that have loamy sand more than 40 inches thick
- Soils that are more sloping than the Selfridge and Crosier soils
- Soils that have a substratum of sand or stratified sand
- Soils that have a surface layer of sandy loam
- Soils that have a thicker solum

Contrasting inclusions:
- Brookston soils in depressions
- Rensselaer soils in depressions and natural drainageways and on flats

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

SdzaB—Selfridge-Brems complex, 1 to 4 percent slopes

Setting

Landform: Selfridge—till plains; Brems—outwash plains
Position on the landform: Swells

Soil Properties and Qualities

Selfridge

Parent material: Outwash over till
Drainage class: Somewhat poorly drained
Available water capacity: High (about 6.5 inches in the upper 60 inches)

Brems

Parent material: Outwash
Drainage class: Moderately well drained
Available water capacity: Low (about 4.5 inches in the upper 60 inches)

Composition

Selfridge soil and similar inclusions: 50 percent
Brems soil and similar inclusions: 40 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
- Soils that are better drained
- Soils that are less sloping or more sloping than the Selfridge and Brems soils
- Soils that have loamy sand more than 40 inches thick
- Soils that have a sandy substratum
- Soils that have a thicker solum

Contrasting inclusions:
- Crosier and Morocco soils on swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Southwest Series

Taxonomic classification: Fine-silty, mixed, superactive, nonacid, mesic Typic Fluvaquents

Typical Pedon for the Series

Southwest silt loam, 0 to 1 percent slopes, in a cultivated field; 129 feet west and 1,167 feet south of the northeast corner of sec. 8, T. 36 N., R. 5 E.; USGS Foraker topographic quadrangle; latitude 41 degrees 35 minutes 28 seconds N. and longitude 85 degrees 57 minutes 53 seconds W.; Elkhart County, Indiana:

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; common very fine and fine roots throughout; slightly acid; clear wavy boundary.

Bg1—10 to 18 inches; dark grayish brown (10YR 4/2) silty clay loam; weak medium subangular blocky structure; friable; common very fine and fine roots throughout; many fine and medium moderate-continuity interstitial and tubular pores; common medium faint brown (10YR 4/3) masses of iron oxide accumulation in the matrix; slightly acid; clear wavy boundary.

Bg2—18 to 23 inches; dark grayish brown (10YR 4/2) silty clay loam; weak medium subangular blocky structure; friable; common very fine and fine roots throughout; common fine and medium moderate-

continuity interstitial and tubular pores; common medium faint brown (10YR 4/3) masses of iron oxide accumulation in the matrix; slightly acid; clear wavy boundary.

2Ab—23 to 34 inches; black (10YR 2/1) silty clay loam; moderate fine subangular blocky structure; firm; common very fine and fine roots throughout; neutral; clear wavy boundary.

2Bgb—34 to 45 inches; gray (10YR 5/1) silty clay loam; moderate medium subangular blocky structure; firm; many medium distinct brown (10YR 5/3) and common fine prominent yellowish brown (10YR 5/8) masses of iron oxide accumulation in the matrix; neutral; clear wavy boundary.

3Ab1—45 to 55 inches; very dark grayish brown (10YR 3/2) silty clay loam; weak coarse subangular blocky structure; firm; common medium distinct dark yellowish brown (10YR 4/6) masses of iron oxide accumulation in the matrix; neutral; gradual wavy boundary.

3Ab2—55 to 75 inches; very dark grayish brown (10YR 3/2) silty clay loam; weak thick platy structure; friable; common medium distinct dark yellowish brown (10YR 4/6) masses of iron oxide accumulation in the matrix; neutral; gradual wavy boundary.

3Cg—75 to 80 inches; dark gray (5Y 4/1) silt loam; massive; friable; slightly effervescent; slightly alkaline.

Range in Characteristics for MLRA 111

Thickness of the alluvium: 20 to 40 inches
Depth to free carbonates: 40 to more than 80 inches

Ap horizon:
Color—hue of 10YR, value of 4, and chroma of 2 or 3
Reaction—slightly acid or neutral

Bg horizon:
Color—hue of 10YR, value of 4 or 5, and chroma of 2 or less
Texture—silt loam or silty clay loam
Reaction—slightly acid or neutral

2Ab, 2Bgb, or 3Ab horizon:
Color—hue of 10YR or 2.5Y, value of 2 to 6, and chroma of 1 or 2
Texture—silt loam, silty clay loam, clay loam, or loam
Content of rock fragments—0 to 5 percent
Reaction—slightly acid to slightly alkaline

3Cg or 3C horizon:
Color—hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 1 to 4
Texture—loam, silt loam, or clay loam
Content of rock fragments—0 to 5 percent
Reaction—slightly alkaline or moderately alkaline

SnlA—Southwest silt loam, 0 to 1 percent slopes

Setting

Landform: Outwash plains, till plains, and moraines
Position on the landform: Natural drainageways

Soil Properties and Qualities

Parent material: Alluvium over lacustrine deposits
Drainage class: Poorly drained
Available water capacity: High (about 12.5 inches in the upper 60 inches)

Composition

Southwest soil and similar inclusions: 80 percent
Contrasting inclusions: 20 percent

Inclusions

Similar inclusions:
- Soils that have less than 20 inches of overwash
- Soils that have more than 40 inches of overwash
- Soils that have a surface layer of silty clay loam or loam

Contrasting inclusions:
- Crosier, Jamestown, and Williamstown soils on swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Tyner Series

Taxonomic classification: Mixed, mesic Typic Udipsamments

Typical Pedon for the Series

Tyner loamy sand, 0 to 1 percent slopes, in a cultivated field; 400 feet east and 453 feet south of the northwest corner of sec. 20, T. 38 N., R. 7 E.; USGS Bristol topographic quadrangle; latitude 41 degrees 44 minutes 18 seconds N. and longitude 85 degrees 45 minutes 20 seconds W.; Elkhart County, Indiana:

Ap—0 to 12 inches; dark brown (7.5YR 3/3) loamy sand, light brown (7.5YR 6/3) dry; weak fine granular structure; very friable; many fine and few medium roots throughout; 2 percent gravel; very strongly acid; abrupt smooth boundary.

Bw1—12 to 20 inches; strong brown (7.5YR 5/6) loamy sand; weak medium subangular blocky structure; very friable; few medium roots throughout; 4 percent gravel; moderately acid; clear wavy boundary.

Bw2—20 to 27 inches; yellowish brown (10YR 5/6) fine sand; weak medium and coarse subangular blocky structure; very friable; few medium roots throughout; 2 percent gravel; moderately acid; clear wavy boundary.

Bw3—27 to 34 inches; yellowish brown (10YR 5/6) sand; weak coarse subangular blocky structure; very friable; few medium roots throughout; 1 percent gravel; moderately acid; clear wavy boundary.

Bw4—34 to 41 inches; yellowish brown (10YR 5/6) sand; weak coarse subangular blocky structure; very friable; few medium roots throughout; 3 percent gravel; slightly acid; clear wavy boundary.

Bw5—41 to 51 inches; strong brown (7.5YR 5/6) sand; single grain; loose; 9 percent gravel; slightly acid; clear wavy boundary.

Bw6—51 to 60 inches; strong brown (7.5YR 4/6) sand; single grain; loose; 2 percent gravel; slightly acid; clear wavy boundary.

Bw7—60 to 75 inches; strong brown (7.5YR 4/6) coarse sand; single grain; loose; 4 percent gravel; slightly acid; clear wavy boundary.

Bw8—75 to 80 inches; dark brown (7.5YR 4/4) sand; single grain; loose; 5 percent gravel; neutral.

Range in Characteristics for MLRA 98

A or Ap horizon:

Color—hue of 10YR or 7.5YR, value of 3 or 4 (more than 6 dry), and chroma of 2 to 4
Content of rock fragments—0 to 10 percent
Reaction—very strongly acid to neutral

Bw horizon:

Color—hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6
Texture—loamy sand, loamy fine sand, or fine sand; the range includes coarse sand in the lower part
Content of rock fragments—0 to 10 percent
Reaction—very strongly acid to neutral

C horizon (if it occurs):

Color—hue of 10YR, value of 5 or 6, and chroma of 3 to 6
Texture—sand, coarse sand, or fine sand
Content of rock fragments—0 to 10 percent
Reaction—strongly acid to neutral

TxuA—Tyner loamy sand, 0 to 1 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Excessively drained
Available water capacity: Low (about 4.7 inches in the upper 60 inches)

Composition

Tyner soil and similar inclusions: 95 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
- Soils that have lamellae in the subsoil
- Soils that have more clay in the subsoil than the Tyner soil

Contrasting inclusions:
- Osolo soils on the lower swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

TxuB—Tyner loamy sand, 1 to 5 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Excessively drained
Available water capacity: Low (about 4.7 inches in the upper 60 inches)

Composition

Tyner soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
• Soils that have lamellae in the subsoil
• Soils that have more clay in the subsoil than the Tyner soil
• Soils that are more sloping than the Tyner soil
Contrasting inclusions:
• Osolo soils on the lower swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

TxuC—Tyner loamy sand, 5 to 10 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Backslopes and shoulders

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Excessively drained
Available water capacity: Low (about 4.7 inches in the upper 60 inches)

Composition

Tyner soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
• Soils that have lamellae in the subsoil
• Soils that have more clay in the subsoil than the Tyner soil
• Soils that are more sloping than the Tyner soil
Contrasting inclusions:
• Bronson, Osolo, and Selfridge soils on swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

TxuD—Tyner loamy sand, 10 to 18 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Backslopes

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Excessively drained
Available water capacity: Low (about 4.7 inches in the upper 60 inches)

Composition

Tyner soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
• Soils that have lamellae in the subsoil
• Soils that have more clay in the subsoil than the Tyner soil
• Soils that are more sloping than the Tyner soil
Contrasting inclusions:
• Bronson and Selfridge soils on swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Windbreaks and Environmental Plantings” section

- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

TxuF—Tyner loamy sand, 18 to 45 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Backslopes

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Excessively drained
Available water capacity: Low (about 4.7 inches in the upper 60 inches)

Composition

Tyner soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
- Soils that have lamellae in the subsoil
- Soils that have more clay in the subsoil than the Tyner soil

Contrasting inclusions:
- Bronson and Selfridge soils on swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Windbreaks and Environmental Plantings” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Uam—Udorthents, loamy

General Description

- This map unit consists of excavations and filled-in areas. Generally, these areas consist of mixed, loamy soil materials.

Soil Properties and Qualities

Parent material: Glacial till
Drainage class: Very poorly drained to well drained
Available water capacity: Low to high

Composition

Udorthents: 95 percent
Contrasting inclusions: 5 percent

Inclusions

Contrasting inclusions:
- Sand and gravel deposits on moraines

Management

- Onsite investigation is needed to determine site characteristics and develop interpretive information.

Uaz—Psamments

General Description

- This map unit consists of excavations and filled-in areas. Generally, these areas consist of mixed, sandy soil materials.

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Very poorly drained to well drained
Available water capacity: Very low (about 2.4 inches in the upper 60 inches)

Composition

Psamments and similar inclusions: 95 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
- Loamy materials

Contrasting inclusions:
- Areas of exposed till

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Windbreaks and Environmental Plantings” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Uba—Psammaquents, 0 to 1 percent slopes

General Description

• This map unit consists of excavations and filled-in areas. Generally, these areas consist of wet, mixed, sandy soil materials. The map unit occurs near highway interchanges.

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Very poorly drained to well drained
Available water capacity: Very low (about 2.4 inches in the upper 60 inches)

Composition

Psammaquents and similar inclusions: 75 percent
Contrasting inclusions: 25 percent

Inclusions

Similar inclusions:
• Soils that are more sloping than the Psammaquents
Contrasting inclusions:
• Areas of water at or near the surface in excavations
• Areas in which the water table is at a depth of more than 6 feet

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Windbreaks and Environmental Plantings" section
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" section
- "Soil Properties" section

UdeA—Urban land-Bainter complex, 0 to 1 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Swells

Soil Properties and Qualities

Bainter

Parent material: Outwash
Drainage class: Well drained
Available water capacity: Moderate (about 6.7 inches in the upper 60 inches)

Composition

Urban land: 55 percent
Bainter soil and similar inclusions: 40 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
• Soils that have more clay in the subsoil than the Bainter soil
• Soils that have a thinner solum than that of the Bainter soil
Contrasting inclusions:
• Bristol soils on the higher swells and on backslopes and shoulders
• Soils that have a water table closer to the surface than that in the Bainter soil

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Windbreaks and Environmental Plantings" section
- "Recreation" section
- "Engineering" section
- "Soil Properties" section

UdkA—Urban land-Brady complex, 0 to 1 percent slopes

Setting

Landform: Outwash plains and outwash terraces
Position on the landform: Swells

Soil Properties and Qualities

Brady

Parent material: Till over outwash
Drainage class: Somewhat poorly drained
Available water capacity: Moderate (about 7.6 inches in the upper 60 inches)

Composition

Urban land: 55 percent
Brady soil and similar inclusions: 40 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
• Soils that are better drained than the Brady soil
• Soils that have less clay and more sand in the solum than the Brady soil

• Soils that have more clay in the subsoil than the Brady soil
• Soils that have a thicker dark surface layer than that of the Brady soil
Contrasting inclusions:
• Brems soils on the higher swells
• Gilford soils in depressions and natural drainageways and on flats
• Morocco soils on swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Windbreaks and Environmental Plantings" section
- "Recreation" section
- "Engineering" section
- "Soil Properties" section

UdoA—Urban land-Brems complex, 0 to 1 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Swells

Soil Properties and Qualities

Brems

Parent material: Outwash
Drainage class: Moderately well drained
Available water capacity: Low (about 4.5 inches in the upper 60 inches)

Composition

Urban land: 55 percent
Brems soil and similar inclusions: 40 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
• Soils that are better drained than the Brems soil
Contrasting inclusions:
• Morocco soils on the lower swells
• Tyner soils on the higher swells and on backslopes and shoulders

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Windbreaks and Environmental Plantings" section
- "Recreation" section
- "Engineering" section
- "Soil Properties" section

UdpA—Urban land-Bristol complex, 0 to 1 percent slopes

Setting

Landform: Outwash plains, outwash terraces, and kames
Position on the landform: Swells

Soil Properties and Qualities

Bristol

Parent material: Outwash
Drainage class: Excessively drained
Available water capacity: Low (about 4.7 inches in the upper 60 inches)

Composition

Urban land: 55 percent
Bristol soil and similar inclusions: 40 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
• Soils that have less clay in the subsoil than the Bristol soil
• Soils that are more sloping than the Bristol soil
Contrasting inclusions:
• Osolo and Vistula soils on the lower swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Windbreaks and Environmental Plantings" section
- "Recreation" section
- "Engineering" section
- "Soil Properties" section

UdpB—Urban land-Bristol complex, 1 to 5 percent slopes

Setting

Landform: Outwash plains, outwash terraces, and kames
Position on the landform: Swells

Soil Properties and Qualities

Bristol

Parent material: Outwash

Drainage class: Excessively drained
Available water capacity: Low (about 4.7 inches in the upper 60 inches)

Composition

Urban land: 55 percent
Bristol soil and similar inclusions: 40 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
- Soils that have less clay in the subsoil than the Bristol soil
- Soils that are less sloping than the Bristol soil
- Soils that have more clay in the subsoil than the Bristol soil

Contrasting inclusions:
- Brady, Bronson, Osolo, and Vistula soils on the lower swells
- Soils that are more sloping than the Bristol soil

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Windbreaks and Environmental Plantings" section
- "Recreation" section
- "Engineering" section
- "Soil Properties" section

UdrA—Urban land-Bronson complex, 0 to 1 percent slopes

Setting

Landform: Outwash plains, valley trains, and low-lying moraines
Position on the landform: Swells

Soil Properties and Qualities

Bronson

Parent material: Outwash
Drainage class: Moderately well drained
Available water capacity: Moderate (about 8.6 inches in the upper 60 inches)

Composition

Urban land: 55 percent
Bronson soil and similar inclusions: 40 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
- Soils that are better drained than the Bronson soil
- Soils that have a darker surface layer than that of the Bronson soil
- Soils that have loamy sand more than 20 inches thick in the upper part of the solum

Contrasting inclusions:
- Brady soils on the lower swells
- Gilford soils in depressions and natural drainageways and on flats

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Windbreaks and Environmental Plantings" section
- "Recreation" section
- "Engineering" section
- "Soil Properties" section

UeaA—Urban land-Crosier complex, 0 to 3 percent slopes

Setting

Landform: Till plains
Position on the landform: Swells

Soil Properties and Qualities

Crosier

Parent material: Glacial till
Drainage class: Somewhat poorly drained
Available water capacity: High (about 7.0 inches in the upper 60 inches)

Composition

Urban land: 55 percent
Crosier soil and similar inclusions: 40 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
- Soils that have a darker surface layer than that of the Crosier soil
- Soils that are more sloping than the Crosier soil
- Soils that have a surface layer of sandy loam
- Soils that have a thicker or thinner solum than that of the Crosier soil

Contrasting inclusions:
- Baugo and Selfridge soils on swells

• Brookston soils in depressions
• Rensselaer soils in depressions and natural drainageways and on flats

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Windbreaks and Environmental Plantings” section
- “Recreation” section
- “Engineering” section
- “Soil Properties” section

UeqA—Urban land-Gilford complex, 0 to 1 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Depressions, natural drainageways, and flats

Soil Properties and Qualities

Gilford

Parent material: Outwash
Drainage class: Poorly drained
Available water capacity: Moderate (about 7.1 inches in the upper 60 inches)

Composition

Urban land: 55 percent
Gilford soil and similar inclusions: 40 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
• Soils that have more sand and less clay in the subsoil than the Gilford soil
• Soils that have a surface layer of mucky loam
• Soils that have a thicker solum than that of the Gilford soil
Contrasting inclusions:
• Sebewa soils in depressions and natural drainageways and on flats
• Brady soils on swells
• Rensselaer soils in the shallower depressions and natural drainageways and on flats

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Windbreaks and Environmental Plantings” section
- “Recreation” section
- “Engineering” section
- “Soil Properties” section

UfzA—Urban land-Mishawaka complex, 0 to 1 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Swells

Soil Properties and Qualities

Mishawaka

Parent material: Outwash
Drainage class: Well drained
Available water capacity: Low (about 5.9 inches in the upper 60 inches)

Composition

Urban land: 55 percent
Mishawaka soil and similar inclusions: 40 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
• Soils that have more clay in the subsoil than the Mishawaka soil
Contrasting inclusions:
• Soils in which the water table is closer to the surface than that in the Mishawaka soil

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Windbreaks and Environmental Plantings” section
- “Recreation” section
- “Engineering” section
- “Soil Properties” section

UgaA—Urban land-Morocco complex, 0 to 1 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Swells

Soil Properties and Qualities

Morocco

Parent material: Outwash
Drainage class: Somewhat poorly drained

Available water capacity: Low (about 4.8 inches in the upper 60 inches)

Composition

Urban land: 55 percent
Morocco soil and similar inclusions: 40 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
• Soils that are better drained than the Morocco soil
• Soils that have more clay in the subsoil than the Morocco soil
• Soils that have a thicker surface layer than that of the Morocco soil
Contrasting inclusions:
• Adrian soils in depressions and natural drainageways
• Maumee soils in depressions and on flats

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Windbreaks and Environmental Plantings" section
- "Recreation" section
- "Engineering" section
- "Soil Properties" section

UglA—Urban land-Osolo complex, 0 to 1 percent slopes

Setting

Landform: Outwash plains and outwash terraces
Position on the landform: Swells

Soil Properties and Qualities

Osolo

Parent material: Outwash
Drainage class: Moderately well drained
Available water capacity: Low (about 5.0 inches in the upper 60 inches)

Composition

Urban land: 55 percent
Osolo soil and similar inclusions: 40 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
• Soils that are better drained than the Osolo soil
• Soils that have lamellae in the subsoil
• Soils that have more clay in the subsoil than the Osolo soil
Contrasting inclusions:
• Brems soils on the lower swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Windbreaks and Environmental Plantings" section
- "Recreation" section
- "Engineering" section
- "Soil Properties" section

UgrA—Urban land-Rensselaer complex, 0 to 1 percent slopes

Setting

Landform: Till plains
Position on the landform: Depressions, natural drainageways, and flats

Soil Properties and Qualities

Rensselaer

Parent material: Outwash over till
Drainage class: Very poorly drained
Available water capacity: High (about 10.4 inches in the upper 60 inches)

Composition

Urban land: 55 percent
Rensselaer soil and similar inclusions: 40 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
• Soils that have less sand and more clay in the solum than the Rensselaer soil
• Soils that do not have strata of sand
• Soils that have not been drained
Contrasting inclusions:
• Baugo soils on swells
• Gilford soils in the deeper depressions and natural drainageways and on flats

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Windbreaks and Environmental Plantings" section
- "Recreation" section

- “Engineering” section
- “Soil Properties” section

UgsB—Urban land-Riddles-Oshtemo complex, 1 to 5 percent slopes

Setting

Landform: Riddles—till plains and moraines; Oshtemo—moraines
Position on the landform: Swells

Soil Properties and Qualities

Riddles

Parent material: Glacial till
Drainage class: Well drained
Available water capacity: High (about 8.9 inches in the upper 60 inches)

Oshtemo

Parent material: Outwash
Drainage class: Well drained
Available water capacity: Low (about 7.6 inches in the upper 60 inches)

Composition

Urban land: 55 percent
Riddles soil and similar inclusions: 25 percent
Oshtemo soil and similar inclusions: 10 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
- Soils that have a surface layer of loam or loamy sand
- Soils that are less sloping than the Riddles and Oshtemo soils
- Soils that have a thinner solum than that of the Riddles and Oshtemo soils

Contrasting inclusions:
- Crosier soils on the lower swells
- Metea soils on backslopes and shoulders
- Soils that are more sloping than the Riddles and Oshtemo soils
- Tyner soils on swells, backslopes, and shoulders
- Williamstown soils on the lower swells and backslopes

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Windbreaks and Environmental Plantings” section
- “Recreation” section
- “Engineering” section
- “Soil Properties” section

UgvA—Urban land-Tyner complex, 0 to 1 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Swells

Soil Properties and Qualities

Tyner

Parent material: Outwash
Drainage class: Excessively drained
Available water capacity: Low (about 4.7 inches in the upper 60 inches)

Composition

Urban land: 55 percent
Tyner soil and similar inclusions: 40 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
- Soils that have lamellae in the subsoil
- Soils that have more clay in the subsoil than the Tyner soil

Contrasting inclusions:
- Osolo soils on the lower swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Windbreaks and Environmental Plantings” section
- “Recreation” section
- “Engineering” section
- “Soil Properties” section

UgvB—Urban land-Tyner complex, 1 to 5 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Swells

Soil Properties and Qualities

Tyner

Parent material: Outwash
Drainage class: Excessively drained

Available water capacity: Low (about 4.7 inches in the upper 60 inches)

Composition

Urban land: 55 percent
Tyner soil and similar inclusions: 40 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
- Soils that have lamellae in the subsoil
- Soils that have more clay in the subsoil than the Tyner soil
- Soils that are more sloping than the Tyner soil

Contrasting inclusions:
- Osolo soils on the lower swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Windbreaks and Environmental Plantings" section
- "Recreation" section
- "Engineering" section
- "Soil Properties" section

UgwA—Urban land-Vistula complex, 0 to 1 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Swells

Soil Properties and Qualities

Vistula

Parent material: Outwash
Drainage class: Well drained
Available water capacity: Low (about 5.5 inches in the upper 60 inches)

Composition

Urban land: 55 percent
Vistula soil and similar inclusions: 40 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
- Soils that are better drained than the Vistula soil
- Soils that have less clay in the subsoil than the Vistula soil
- Soils that are more sloping than the Vistula soil

Contrasting inclusions:
- Brady and Bronson soils on the lower swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Windbreaks and Environmental Plantings" section
- "Recreation" section
- "Engineering" section
- "Soil Properties" section

UhbA—Urban land-Volinia complex, 0 to 1 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Swells

Soil Properties and Qualities

Volinia

Parent material: Outwash
Drainage class: Well drained
Available water capacity: Moderate (about 6.1 inches in the upper 60 inches)

Composition

Urban land: 55 percent
Volinia soil and similar inclusions: 40 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
- Soils that have less clay in the subsoil than the Volinia soil
- Soils that have a thinner solum than that of the Volinia soil
- Soils that have a thinner surface layer than that of the Volinia soil

Contrasting inclusions:
- Soils in which the water table is closer to the surface than that in the Volinia soil

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Windbreaks and Environmental Plantings" section

- “Recreation” section
- “Engineering” section
- “Soil Properties” section

Usl—Udorthents, rubbish

General Description

• This map unit consists of areas used as sanitary landfills. Generally, these are areas where rubbish is currently being placed or buried or has previously been placed or buried. In some areas, demolished building materials were buried and new developments established, including recreational developments.

Soil Properties and Qualities

Parent material: Till, outwash, loess, bedrock, or lacustrine material
Drainage class: Well drained
Available water capacity: Variable

Composition

Udorthents and similar inclusions: 95 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
• Soils that are more sloping than the Udorthents
• Soils that have less clay in the surface layer or in the subsurface layer than the Udorthents
Contrasting inclusions:
• Areas of undisturbed soils

Management

• Onsite investigation is needed to determine site characteristics and develop interpretive information.

Vistula Series

Taxonomic classification: Mixed, mesic Psammentic Hapludalfs

Typical Pedon for the Series

Vistula loamy sand, 0 to 1 percent slopes, in a cultivated field; 1,700 feet south and 2,360 feet west of the northeast corner of sec. 23, T. 37 N., R. 7 E.; USGS Middlebury topographic quadrangle; latitude 41 degrees 38 minutes 57.7 seconds N. and longitude 85 degrees 41 minutes 7.3 seconds W.; Elkhart County, Indiana:

Ap—0 to 9 inches; dark brown (10YR 3/3) loamy sand, light brownish gray (10YR 6/2) dry; the lower 2 inches of the horizon has a mixture of E material (10 percent) and A material (90 percent); weak fine granular structure; very friable; common very fine and fine roots throughout; common very fine and fine moderate-continuity interstitial and tubular pores; 5 percent gravel and 1 percent cobbles; neutral; abrupt smooth boundary.

E—9 to 14 inches; dark yellowish brown (10YR 4/4) gravelly loamy sand, light yellowish brown (10YR 6/4) dry; weak medium subangular blocky structure; very friable; common very fine and fine roots throughout; common very fine and fine moderate-continuity interstitial and tubular pores; 25 percent gravel and 1 percent cobbles; neutral; clear wavy boundary.

Bt1—14 to 19 inches; strong brown (7.5YR 4/6) loamy sand; weak medium subangular blocky structure; friable; common very fine and fine roots throughout; common very fine and fine moderate-continuity interstitial and tubular pores; many distinct continuous brown (7.5YR 4/4) clay films on faces of peds; 2 percent gravel and 1 percent cobbles; neutral; clear wavy boundary.

Bt2—19 to 25 inches; strong brown (7.5YR 4/6) loamy sand; weak coarse subangular blocky structure; very friable; common very fine and fine roots throughout; common very fine and fine moderate-continuity interstitial and tubular pores; common faint discontinuous strong brown (7.5YR 4/6) clay films on faces of peds; 2 percent gravel; neutral; clear wavy boundary.

Bt3—25 to 36 inches; strong brown (7.5YR 5/6) loamy sand; weak coarse subangular blocky structure; very friable; common very fine and fine moderate-continuity interstitial and tubular pores; few distinct patchy dark brown (7.5YR 3/4) clay films on faces of peds; 2 percent gravel; neutral; clear wavy boundary.

Bt4—36 to 45 inches; yellowish brown (10YR 5/6) loamy sand; weak coarse subangular blocky structure; very friable; few distinct patchy dark brown (7.5YR 3/4) clay films on faces of peds; 5 percent gravel; neutral; clear wavy boundary.

2Bt5—45 to 58 inches; 80 percent dark brown (7.5YR 3/2) and 20 percent brown (7.5YR 4/4) gravelly sandy loam; weak medium subangular blocky structure; friable; many faint discontinuous dark brown (7.5YR 3/2) clay bridges between sand grains; 16 percent gravel; neutral; clear wavy boundary.

2C/Bt—58 to 75 inches; 80 percent yellowish brown (10YR 5/4) sand (C); single grain; loose; common medium distinct dark yellowish brown (10YR 4/6) masses of iron oxide accumulation in the matrix;

common medium distinct grayish brown (10YR 5/2) iron depletions; 10 percent gravel; strongly effervescent; slightly alkaline; 20 percent yellowish brown (10YR 5/4) loamy sand (Bt); weak medium subangular blocky structure; very friable; many prominent discontinuous dark brown (7.5YR 3/2) clay bridges between sand grains; common medium distinct dark yellowish brown (10YR 4/6) masses of iron oxide accumulation in the matrix; few fine rounded black (N 2/0) iron-manganese oxide concretions throughout; common medium faint grayish brown (10YR 5/2) iron depletions; 10 percent gravel; slightly effervescent; slightly alkaline; clear wavy boundary.

2C—75 to 80 inches; brown (10YR 5/3) sand and gravelly sand; single grain; loose; many medium faint grayish brown (10YR 5/2) iron depletions; 20 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics for MLRA 98

Depth to the base of the argillic horizon: 40 to 80 inches
Depth to redoximorphic features: 40 to 72 inches

A or Ap horizon:
Color—hue of 10YR, value of 2 to 4 (6 or more dry), and chroma of 2 or 3
Content of rock fragments—0 to 14 percent
Reaction—moderately acid to neutral

E horizon:
Color—hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 or 4
Texture—loamy sand or gravelly loamy sand
Content of rock fragments—0 to 25 percent
Reaction—moderately acid to neutral

Bt or 2Bt horizon:
Color—hue of 5YR, 7.5YR, or 10YR, value and chroma of 4 to 6; value of 3 and chroma of 2 or 3 below a depth of 40 inches in some pedons
Texture—loamy sand, sand, gravelly loamy sand, or gravelly sand
Content of rock fragments—1 to 25 percent
Reaction—moderately acid to neutral

2C/Bt horizon (if it occurs):
Colors and textures—similar to those of the Bt or 2C horizon
Content of rock fragments—similar to that of the Bt or 2C horizon
Reaction—similar to that of the Bt or 2C horizon

2C or 2Cg horizon:
Color—hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 to 4
Texture—sand or gravelly sand
Content of rock fragments—1 to 30 percent
Reaction—slightly alkaline to moderately alkaline

VnxA—Vistula loamy sand, 0 to 1 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Well drained
Available water capacity: Moderate (about 5.5 inches in the upper 60 inches)

Composition

Vistula soil and similar inclusions: 95 percent
Contrasting inclusions: 5 percent

Inclusions

Similar inclusions:
- Soils that are better drained than the Vistula soil
- Soils that have less clay in the subsoil than the Vistula soil
- Soils that are more sloping than the Vistula soil

Contrasting inclusions:
- Brady and Bronson soils on the lower swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Volinia Series

Taxonomic classification: Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Pachic Argiudolls

Typical Pedon for the Series

Volinia loam, 0 to 1 percent slopes, in a cultivated field; 80 feet north and 758 feet west of the southeast corner of sec. 26, T. 36 N., R. 6 E.; USGS Goshen topographic quadrangle; latitude 41 degrees 32

minutes 18 seconds N. and longitude 85 degrees 47 minutes 31 seconds W.; Elkhart County, Indiana:

Ap—0 to 9 inches; dark brown (7.5YR 3/2) loam, dark brown (10YR 3/3) dry; weak fine subangular blocky structure parting to moderate fine granular; friable; many very fine and fine roots between peds; many very fine and fine tubular pores; 2 percent gravel; neutral; abrupt smooth boundary.

2Bt1—9 to 13 inches; dark brown (10YR 3/3) gravelly sandy clay loam, brown (10YR 4/3) dry; moderate medium subangular blocky structure; friable; common very fine and fine roots between peds; many very fine and fine tubular pores; few faint continuous very dark grayish brown (10YR 3/2) clay films on faces of peds and in pores; 15 percent gravel; neutral; clear wavy boundary.

2Bt2—13 to 23 inches; dark brown (7.5YR 3/3) gravelly sandy clay loam, brown (7.5YR 4/3) dry; moderate medium subangular blocky structure; friable; common very fine and fine roots between peds; common very fine and fine tubular pores; few faint continuous dark brown (7.5YR 3/2) clay films on faces of peds and in pores; 27 percent gravel; neutral; clear wavy boundary.

3Bt3—23 to 33 inches; dark brown (7.5YR 3/4) gravelly loamy coarse sand; moderate medium subangular blocky structure; friable; common very fine and fine roots between peds; common very fine and fine tubular pores; few faint continuous dark brown (7.5YR 3/3) clay films on faces of peds and in pores; 23 percent gravel; neutral; clear irregular boundary.

3Bt4—33 to 45 inches; brown (7.5YR 4/4) sand; weak coarse subangular blocky structure; very friable; common very fine and fine roots between peds; common very fine and fine tubular pores; few faint patchy brown (7.5YR 4/3) clay films between sand grains; 6 percent gravel; neutral; clear irregular boundary.

3Bt5—45 to 58 inches; brown (7.5YR 4/4) sand; weak coarse subangular blocky structure; very friable; common very fine and fine roots throughout; common very fine and fine tubular pores; few faint patchy brown (7.5YR 4/3) clay films between sand grains; 4 percent gravel; neutral; clear irregular boundary.

3C—58 to 80 inches; brown (10YR 5/3) gravelly sand and gravelly coarse sand; single grain; loose; 23 percent gravel; violently effervescent; moderately alkaline.

Range in Characteristics for MLRA 98

Thickness of the mollic epipedon: 20 to 28 inches
Depth to the base of the argillic horizon: 40 to 70 inches
Depth to sand and gravel: 20 to 40 inches
Depth to free carbonates: 40 to 70 inches

A or Ap horizon:
Color—hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 1 to 3
Content of rock fragments—0 to 5 percent
Reaction—moderately acid to neutral

2Bt horizon:
Color—hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 3 to 6
Texture—clay loam, sandy clay loam, gravelly clay loam, or gravelly sandy clay loam
Content of rock fragments—5 to 30 percent
Reaction—strongly acid to neutral

3Bt horizon:
Color—hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 3 to 6
Texture—loamy sand, loamy coarse sand, coarse sand, sand, or the gravelly analogs of these textures
Content of rock fragments—2 to 30 percent
Reaction—slightly acid to slightly alkaline

3C horizon:
Color—hue of 10YR, value of 4 or 5, and chroma of 3 to 6
Texture—stratified sand to very gravelly coarse sand
Content of rock fragments—10 to 45 percent
Reaction—slightly alkaline or moderately alkaline; calcium carbonate equivalent of 20 to 50 percent

VolA—Volinia loam, 0 to 1 percent slopes

Setting

Landform: Outwash plains
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Outwash
Drainage class: Well drained
Available water capacity: Moderate (about 6.1 inches in the upper 60 inches)

Composition

Volinia soil and similar inclusions: 98 percent
Contrasting inclusions: 2 percent

Inclusions

Similar inclusions:
• Soils that have less clay in the subsoil than the Volinia soil
• Soils that have a thinner solum than that of the Volinia soil
• Soils that have a thinner surface layer than that of the Volinia soil
Contrasting inclusions:
• Soils in which the water table is closer to the surface than that in the Volinia soil

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Agronomy" section (fig. 10)
- "Forestland" section
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" section
- "Soil Properties" section

Waterford Series

Taxonomic classification: Coarse-loamy, mixed, active, mesic Fluvaquentic Eutrochrepts

Typical Pedon for the Series

Waterford loam, 0 to 2 percent slopes, frequently flooded, long duration, in a wooded area; 2,367 feet north and 2,143 feet east of the southwest corner of sec. 16, T. 36 N., R. 6 E.; USGS Goshen topographic quadrangle; latitude 41 degrees 34 minutes 22 seconds N. and longitude 85 degrees 50 minutes 26 seconds W.; Elkhart County, Indiana:

A—0 to 8 inches; dark brown (10YR 3/3) loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; many medium roots throughout; common very fine and fine moderate-continuity interstitial and tubular pores; neutral; clear wavy boundary.

Bw1—8 to 15 inches; dark yellowish brown (10YR 4/4) sandy loam; weak medium subangular blocky structure; very friable; common very fine, fine, and medium roots throughout; many fine and medium moderate-continuity interstitial and tubular pores; very few distinct discontinuous dark brown (10YR 3/3) organic coats in root channels and/or pores; common fine distinct dark grayish brown (10YR 4/2) iron depletions in the matrix; neutral; clear wavy boundary.

Bw2—15 to 24 inches; brown (10YR 4/3) loam; moderate medium subangular blocky structure; friable; common very fine, fine, and medium roots throughout; many very fine, fine, and medium moderate-continuity interstitial and tubular pores; common fine distinct grayish brown (10YR 5/2) iron depletions in the matrix; many fine distinct brown (7.5YR 4/4) masses of iron oxide accumulation in the matrix; few fine rounded dark brown (7.5YR 3/2) soft masses of iron-manganese oxide accumulation throughout in the matrix; neutral; clear wavy boundary.

Bw3—24 to 36 inches; dark yellowish brown (10YR 4/4) loam; moderate medium subangular blocky structure; friable; common very fine, fine, and medium roots throughout; many very fine, fine, and medium moderate-continuity interstitial and tubular pores; many fine distinct grayish brown (10YR 5/2) iron depletions in the matrix; common fine faint yellowish brown (10YR 5/6) masses of iron oxide accumulation in the matrix; few fine rounded very dark brown (7.5YR 2/2) masses of iron-manganese oxide accumulation throughout; neutral; clear wavy boundary.

Bw4—36 to 41 inches; yellowish brown (10YR 5/4) loam; moderate medium subangular blocky structure; friable; common very fine and fine roots throughout; common fine moderate-continuity interstitial and tubular pores; many medium distinct gray (10YR 5/1) iron depletions in the matrix; many medium prominent yellowish brown (10YR 5/8) masses of iron oxide accumulation in the matrix; few fine rounded black (N 2/0) masses of iron-manganese accumulation throughout; neutral; clear wavy boundary.

2C—41 to 46 inches; brown (10YR 5/3) sand; single grain; loose; many medium distinct grayish brown (10YR 5/2) iron depletions; strongly effervescent; slightly alkaline; clear wavy boundary.

3Ab—46 to 50 inches; black (10YR 2/1) mucky sandy loam; massive; very friable; common fine moderate-continuity interstitial and tubular pores; common medium distinct gray (10YR 5/1) iron depletions; neutral; clear wavy boundary.

3Cb—50 to 60 inches; brown (10YR 5/3) gravelly coarse sand; single grain; loose; many medium distinct gray (10YR 5/1) iron depletions; 25 percent gravel; strongly effervescent; slightly alkaline; clear wavy boundary.

Figure 10.—Soybeans in an area of Volinia loam, 0 to 1 percent slopes.

3Cgb—60 to 80 inches; dark gray (10YR 4/1) gravelly coarse sand; single grain; loose; 30 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics for MLRA 98

Depth to the base of the cambic horizon: 24 to 46 inches

A or Ap horizon:
Color—hue of 10YR, value of 3 or 4, and chroma of 2 or 3
Reaction—slightly acid to slightly alkaline

Bw or Bg horizon:
Color—hue of 10YR, value of 4 or 5, and chroma of 2 to 6
Texture—loam, sandy loam, or fine sandy loam
Reaction—neutral or slightly alkaline

3Ab horizon (if it occurs):
Color—hue of 10YR, value of 2 or 3, and chroma of 1 or 2
Texture—mucky sandy loam or sandy loam
Content of rock fragments—0 to 10 percent
Reaction—neutral or slightly alkaline

2C, 2Cg, 3Cb, or 3Cgb horizon:
Color—hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4
Texture—sand, loamy sand, coarse sand, very gravelly coarse sand, or gravelly coarse sand
Reaction—neutral to moderately alkaline

WcnAI—Waterford loam, 0 to 2 percent slopes, frequently flooded, long duration

Setting

Landform: Flood plains
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Alluvium
Drainage class: Somewhat poorly drained

Available water capacity: Moderate (about 5.9 inches in the upper 60 inches)

Composition

Waterford soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
- Soils that are better drained than the Waterford soil
- Soils that have a darker surface layer than that of the Waterford soil
- Soils that have a surface layer of fine sandy loam or sandy loam

Contrasting inclusions:
- Abscota soils on the higher swells
- Adrian and Gravelton soils in depressions and natural drainageways

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Windbreaks and Environmental Plantings" section
- "Forestland" section
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" section
- "Soil Properties" section

Williamstown Series

Taxonomic classification: Fine-loamy, mixed, active, mesic Aquic Hapludalfs

Typical Pedon for the Series

Williamstown silt loam, on a convex slope of 4 percent, in a cultivated field about 3 miles north of Westport; 1,030 feet west and 2,080 feet north of the southeast corner of sec. 23, T. 9 N., R. 8 E.; Decatur County, Indiana:

Ap—0 to 9 inches; 90 percent brown (10YR 5/3) silt loam, pale brown (10YR 6/3) dry; 10 percent yellowish brown (10YR 5/4) clay loam subsoil material; moderate medium granular structure; friable; moderately acid; abrupt smooth boundary.

2Bt1—9 to 18 inches; yellowish brown (10YR 5/6) clay loam; moderate medium subangular blocky structure; firm; many distinct continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; few medium distinct light brownish gray (10YR 6/2) iron depletions in the matrix; 1 percent pebbles; strongly acid; clear wavy boundary.

2Bt2—18 to 33 inches; yellowish brown (10YR 5/6) clay loam; moderate coarse subangular blocky structure; firm; many distinct continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; common medium distinct grayish brown (10YR 5/2) iron depletions in the matrix; common fine black (10YR 2/1) iron-manganese oxide accumulation in the matrix; 1 percent pebbles; slightly acid; clear wavy boundary.

2BC—33 to 37 inches; yellowish brown (10YR 5/6) loam; weak coarse subangular blocky structure; firm; common distinct discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; 1 percent pebbles; slightly effervescent; slightly alkaline; clear wavy boundary.

2Cd—37 to 60 inches; yellowish brown (10YR 5/4) loam; massive; very firm; common fine distinct gray (10YR 6/1) iron depletions in the matrix; 1 percent pebbles; strongly effervescent; moderately alkaline.

Range in Characteristics for MLRA 111

Depth to the base of the argillic horizon: 20 to 40 inches
Depth to free carbonates: 20 to 40 inches

A or Ap horizon:
Color—hue of 10YR, value of 4 or 5, and chroma of 2 or 3
Texture—silt loam, clay loam, or loam
Content of rock fragments—0 to 10 percent
Reaction—strongly acid to neutral

Bt or 2Bt horizon:
Color—hue of 10YR, value of 4 or 5, and chroma of 3 to 6
Texture—silty clay loam or clay loam
Content of rock fragments—0 to 10 percent
Reaction—strongly acid to neutral

BC or 2BC horizon:
Color—hue of 10YR, value of 4 to 6, and chroma of 3 to 6
Texture—loam or fine sandy loam
Content of rock fragments—1 to 10 percent
Reaction—neutral to moderately alkaline

Cd or 2Cd horizon:
Color—hue of 10YR, value of 5 or 6, and chroma of 3 or 4
Texture—loam or fine sandy loam
Content of rock fragments—1 to 10 percent
Reaction—slightly alkaline or moderately alkaline

WoaA—Williamstown loam, 0 to 1 percent slopes

Setting

Landform: Till plains and moraines
Position on the landform: Swells

Soil Properties and Qualities

Parent material: Glacial till
Drainage class: Moderately well drained
Available water capacity: High (about 7.5 inches in the upper 60 inches)

Composition

Williamstown soil and similar inclusions: 85 percent
Contrasting inclusions: 15 percent

Inclusions

Similar inclusions:
- Soils that are better drained than the Williamstown soil
- Soils that have a darker surface layer than that of the Williamstown soil
- Soils that are more sloping than the Williamstown soil
- Soils that have stratified sand in the substratum
- Soils that have a thicker solum than that of the Williamstown soil

Contrasting inclusions:
- Crosier and Selfridge soils on the lower swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

WobB—Williamstown-Crosier complex, 1 to 5 percent slopes

Setting

Landform: Williamstown—till plains and moraines; Crosier—till plains
Position on the landform: Swells

Soil Properties and Qualities

Williamstown

Parent material: Glacial till
Drainage class: Moderately well drained
Available water capacity: High (about 7.5 inches in the upper 60 inches)

Crosier

Parent material: Glacial till
Drainage class: Somewhat poorly drained
Available water capacity: High (about 7.0 inches in the upper 60 inches)

Composition

Williamstown soil and similar inclusions: 55 percent
Crosier soil and similar inclusions: 25 percent
Contrasting inclusions: 20 percent

Inclusions

Similar inclusions:
- Soils that are better drained
- Soils that are moderately eroded
- Soils that are more sloping than the Williamstown and Crosier soils
- Soils that have a surface layer of sandy loam
- Soils that have stratified sand in the substratum
- Soils that have a thicker solum

Contrasting inclusions:
- Brookston soils in depressions
- Rensselaer soils in depressions and natural drainageways and on flats
- Riddles soils on the higher swells, backslopes, and shoulders
- Selfridge soils on the lower swells

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

WocC2—Williamstown loam, 5 to 10 percent slopes, eroded

Setting

Landform: Till plains and moraines

Position on the landform: Backslopes

Soil Properties and Qualities

Parent material: Glacial till
Drainage class: Moderately well drained
Available water capacity: High (about 7.5 inches in the upper 60 inches)

Composition

Williamstown soil and similar inclusions: 80 percent
Contrasting inclusions: 20 percent

Inclusions

Similar inclusions:
- Soils that are better drained than the Williamstown soil
- Soils that are more sloping than the Williamstown soil
- Soils that are severely eroded
- Soils that have stratified sand in the substratum
- Soils that have a thicker solum than that of the Williamstown soil

Contrasting inclusions:
- Brookston soils in depressions
- Crosier soils on the lower swells
- Riddles soils on the higher swells, backslopes, and shoulders
- Southwest soils in natural drainageways

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Agronomy" section
- "Forestland" section
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" section
- "Soil Properties" section

WodC3—Williamstown clay loam, 5 to 10 percent slopes, severely eroded

Setting

Landform: Till plains and moraines
Position on the landform: Backslopes

Soil Properties and Qualities

Parent material: Glacial till
Drainage class: Moderately well drained
Available water capacity: High (about 7.5 inches in the upper 60 inches)

Composition

Williamstown soil and similar inclusions: 80 percent
Contrasting inclusions: 20 percent

Inclusions

Similar inclusions:
- Soils that are better drained than the Williamstown soil
- Soils that are more sloping than the Williamstown soil
- Soils that have stratified sand in the substratum
- Soils that have a thinner solum than that of the Williamstown soil

Contrasting inclusions:
- Brookston soils in depressions
- Crosier soils on the lower swells
- Riddles soils on the higher swells, backslopes, and shoulders
- Southwest soils in natural drainageways

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Agronomy" section
- "Forestland" section
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" section
- "Soil Properties" section

Wunabuna Series

Taxonomic classification: Fine, mixed, superactive, nonacid, mesic Fluvaquentic Endoaquepts

Typical Pedon for the Series

Wunabuna silt loam, drained, 0 to 1 percent slopes, in a cultivated field; 90 feet west and 2,481 feet south of the northeast corner of sec. 34, T. 37 N., R. 5 E.; USGS Foraker topographic quadrangle; latitude 41 degrees 36 minutes 58 seconds N. and longitude 85 degrees 55 minutes 35 seconds W.; Elkhart County, Indiana:

Ap—0 to 7 inches; dark brown (10YR 3/3) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; common fine and

medium roots throughout; common fine to coarse interstitial and tubular pores throughout; neutral; abrupt smooth boundary.

A1—7 to 15 inches; dark brown (10YR 3/3) silty clay loam, light brownish gray (10YR 6/2) dry; weak coarse subangular blocky structure; very firm; common fine and medium roots throughout; common fine to coarse interstitial and tubular pores throughout; neutral; clear smooth boundary.

A2—15 to 19 inches; dark brown (10YR 3/3) silty clay loam, light brownish gray (10YR 6/2) dry; moderate medium subangular blocky structure; firm; common fine and medium roots throughout; common fine to coarse interstitial and tubular pores throughout; neutral; clear smooth boundary.

Bg—19 to 32 inches; dark gray (10YR 4/1) silty clay loam; moderate medium angular blocky structure; firm; many continuous distinct very dark gray (10YR 3/1) organic coats on vertical and horizontal faces of most peds; common fine and medium roots throughout; common fine to coarse interstitial and tubular pores throughout; many fine and medium distinct dark yellowish brown (10YR 4/4) masses of iron oxide accumulation in the matrix; neutral; clear smooth boundary.

2Ab—32 to 38 inches; very dark gray (10YR 3/1) silty clay; moderate medium subangular blocky structure; firm; common fine and medium roots throughout; common coarse interstitial and tubular pores throughout; common continuous distinct dark grayish brown (10YR 4/2) clay depletions in root channels and pores; neutral; abrupt smooth boundary.

3Oa1—38 to 60 inches; muck, black (10YR 2/1) broken face, black (N 2.5/0) rubbed, very dark brown (10YR 2/2) after exposure to air; about 5 percent fiber, 1 percent rubbed; massive; very friable; common coarse interstitial and tubular pores throughout; slightly alkaline; gradual smooth boundary.

3Oa2—60 to 80 inches; muck, black (10YR 2/1) broken face, black (N 2.5/0) rubbed, very dark brown (10YR 2/2) after exposure to air; about 10 percent fiber, 3 percent rubbed; massive; very friable; slightly acid.

Range in Characteristics for MLRA 111

Thickness of the alluvium: 16 to 40 inches

A or Ap horizon:
Color—hue of 10YR, value of 2 to 4 (6 or more dry), and chroma of 1 to 3
Texture—silt loam or silty clay loam
Reaction—slightly acid to slightly alkaline

Bg horizon:
Color—hue of 10YR to 2.5Y, value of 4 or 5, and chroma of 1 or 2
Texture—silty clay or silty clay loam
Reaction—slightly acid to slightly alkaline

Ab or 2Ab horizon:
Color—hue of 10YR or N, value of 2 or 3, and chroma of 0 to 2
Texture—silty clay or silty clay loam
Reaction—slightly acid to slightly alkaline

3Oa horizon:
Color—hue of 10YR or N, value of 2 or 3, and chroma of 0 to 2
Reaction—strongly acid to slightly alkaline

WrxAN—Wunabuna silt loam, drained, 0 to 1 percent slopes

Setting

Landform: Till plains and moraines
Position on the landform: Depressions

Soil Properties and Qualities

Parent material: Alluvium over organic deposits
Drainage class: Very poorly drained
Available water capacity: Very high (about 16.6 inches in the upper 60 inches)

Composition

Wunabuna soil and similar inclusions: 90 percent
Contrasting inclusions: 10 percent

Inclusions

Similar inclusions:
• Soils that have less clay in the mineral horizons than the Wunabuna soil
• Soils that have less than 16 inches of mineral material over the organic material
• Soils that have more than 40 inches of mineral material over the organic material
• Soils that have coprogenous earth below the organic material

Contrasting inclusions:
• Brookston soils in the shallower depressions
• Muskego soils in the deeper depressions

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Agronomy” section
- “Forestland” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” section
- “Soil Properties” section

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Agronomy

This section provides information about the use and management of the soils in the survey area for agronomic purposes.

Crops and Pasture

Randy Franks, district conservationist, Natural Resources Conservation Service, and Darrell E. Brown, conservation agronomist, Natural Resources Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The estimated yields of the main crops and pasture plants are listed, the system of land capability classification used by the Natural Resources Conservation Service is explained, and prime farmland is described.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading “Soil Series and Detailed Soil Map Units.” Specific information can be obtained from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

In 1995, about 92,000 acres in Elkhart County was used for grain crops, mainly corn, soybeans, wheat, and oats; 20,000 acres was used for alfalfa in rotation with grain crops, such as corn or soybeans; and 17,000 acres was permanent pasture (Gann, 1995). Some acreage in the county is used for specialty crops, such as seed corn, Christmas trees, apples, peaches, asparagus, sweet corn, melons, potatoes, pumpkins, cucumbers, and ornamental trees and shrubs. During the period from 1982 to 1992, the amount of farmland in the county dropped from 213,000 acres to 192,000 acres. About 2,000 acres per year is converted from farmland to urban and industrial areas; the soils in some of these converted areas are classified as prime farmland.

Elkhart County has the largest number of dairy farms of all the counties in Indiana, but the number has been decreasing in recent years. In 1982, the county had 518 dairy farms; in 1996, it had only 321 dairy farms (Gann, 1996). The number of confined dairy cows, however, has remained constant at about 47,000 head. Also, swine and poultry confinement operations combined make up a significant part of the total agricultural economy in the county.

The paragraphs that follow describe the major

management concerns affecting crops and pasture in the survey area and the management practices that may be used successfully.

Wind erosion is a major hazard in Elkhart County. Loss of the surface layer through erosion reduces the productivity of the soils. As the surface layer is eroded, nutrients and organic matter are removed and the subsoil, which has a low content of organic matter and low fertility, is incorporated into the plow layer. The subsoil material can restrict seed germination and the availability of plant nutrients. Exposure of the subsoil can increase the hazard of erosion.

Water erosion is a hazard on sloping soils that have a loamy surface layer. Examples are Crosier, Glynwood, Miami, and Williamstown soils. Water erosion can result in clogged tile drains and the sedimentation of creeks, ditches, and waterways. Sediment that contains fertilizer and pesticides can reduce the quality of the water. Controlling erosion reduces the runoff rate, increases the rate of water infiltration, and minimizes the loss of organic matter and the amount of sediment that enters the waterways.

A system of conservation tillage that leaves crop residue on the surface increases the rate of water infiltration and reduces the runoff rate and the hazard of erosion. No-till cropping systems require high levels of management. Herbicides and insecticides are used to control weeds and insects. No-till farming is especially effective in minimizing erosion on the lighter colored, well drained, sloping soils in the county. It minimizes soil compaction, increases the content of organic matter, and is less labor intensive than other systems. In 1996, about 38,000 acres of cropland in the county was planted using a no-till or ridge-till method and 29,000 acres was planted in such a way that crop residue was left on at least 30 percent of the surface (Gann, 1996). These acreages represent 32 percent of the corn, 52 percent of the soybeans, and 60 percent of the wheat grown in the county. No-till farming has many conservation and ecological benefits, including fuel savings, wildlife enhancement, and improvement of soil tilth (fig. 11).

Contour farming can be used in several areas of the county. In areas where slopes are short and irregular, however, this practice is generally not feasible. Other types of conservation measures may be more suitable in these areas.

Grassed waterways are used in areas that have undulating and gently rolling slopes. Grassed waterways help to control gully erosion on sloping soils. They also stabilize areas that are already eroded. Subsurface drains are installed beneath the waterways to remove excess internal water. Removing this water enhances the growth of plants and facilitates the use of machinery. Grassed waterways are effective in areas of Blount, Crosier, Glynwood, Miami, and Williamstown soils.

Grade-stabilization structures are needed in areas where a change in grade allows water to drop so quickly that erosion occurs. These structures are commonly needed where a grassed waterway enters an open ditch.

Water- and sediment-control basins, terraces, and diversions help to control runoff on gently sloping and moderately sloping soils. Terraces and water- and sediment-control basins store runoff behind earthen dams until the water can enter subsurface drains. Diversions route the water to grassed waterways, which empty into suitable outlets.

Filter strips and riparian buffer strips are vegetative plantings of grasses, shrubs, or trees along watercourses. They are designed to trap sediment before it can enter a watercourse. These plantings, commonly used in combination with livestock-exclusion fencing, greatly improve water quality.

Maintaining a protective cover of vegetation on the surface helps to control runoff and increases the rate of water infiltration. Plants and plant roots act as a cushion to absorb the impact of raindrops before they reach the soil. Thus, more water penetrates the surface and less is lost as runoff. A cropping system that keeps crop residue or a plant cover on the surface helps to keep soil losses to a minimum so that the productivity of the soil is maintained. Planting winter cover crops and green manure crops on dairy farms and including grasses or legumes in rotation for forage reduce the hazard of erosion in sloping areas, provide nitrogen for subsequent crops, and improve soil tilth. In 1996, about 37,000 acres was used for rotations of hay or permanent pasture (Gann, 1996).

Erosion cannot be entirely prevented, but it can be controlled so that it does not diminish the productive capacity of the soil. When practices are designed for a particular field or farm, several factors should be considered. These factors include the type of farming operation, the soil type, the length and steepness of the slopes, the crop rotation, tillage methods, and rainfall patterns. Further information about the design of erosion-control measures is available at the local office of the Natural Resources Conservation Service.

Wind erosion is a hazard in areas of soils that have a sandy surface layer, such as Brems, Bristol, Morocco, Oslo, Tyner, and Vistula soils. It is also a hazard in areas of soils that have a mucky surface layer, such as Adrian, Edwards, Houghton, Madaus, Muskego, and Palms soils. More than 34 percent of the county is susceptible to wind erosion, and much of

Figure 11.—No-till corn in an area of Riddles-Oshtemo complex, 1 to 5 percent slopes.

this percentage is cropland. Soils are susceptible to wind erosion in areas where little or no crop residue is left on the surface. Plowing can cover much of the residue. Some crops do not produce large amounts of residue and therefore do not provide protective cover.

Crop damage and soil loss can be severe in fields that have little vegetative cover if the wind is strong and the soil is dry and bare of vegetation or residue. Maintaining a plant cover or keeping the surface rough through proper tillage can minimize the effects of wind erosion. Also, a conservation tillage system that leaves crop residue on the surface helps to control soil blowing on these soils. Field windbreaks also can minimize the effects of soil blowing. On fields where a center-pivot irrigation system is used, low-growing shrubs can be planted as a windbreak. Winter cover crops have also proven effective in controlling wind erosion.

Irrigation makes cultivation practical on droughty soils, such as Bristol, Coloma, Granby, Maumee, Osolo, and Tyner soils, which have a low or moderate available water capacity. Drought can frequently reduce crop yields on these soils. The number of irrigated cropland acres has been steadily increasing in Elkhart County. In 1996, more than 25,000 acres was under some form of irrigation (Gann, 1996). Center-pivot systems are the most popular form of irrigation. Traveling guns and sprinkler systems also are used. Some wells can provide irrigation water at the rate of 2,000 gallons per minute from shallow aquifers with plentiful ground-water supplies. Other sources of irrigation water are ponds, rivers, and ditches. Increased crop yields from irrigation and changes in irrigation equipment have resulted in the use of irrigation for row crops on soils that have slopes of more than 12 percent. Conservation tillage, grassed waterways, and proper management of irrigation water are needed to control runoff, reduce the hazard of erosion, and improve the efficiency of the irrigation system.

Wetness is a limitation on some of the cropland in the county. A drainage system has been installed on about 114,000 acres in the county, about 95,000 acres of which is cropland. Some soils are naturally so wet that, unless they are drained, production of the crops common to the area is not possible. Some of the poorly drained or very poorly drained soils in Elkhart County are Brookston, Gilford, Granby, Gravelton, Maumee, Milford, Morocco, Pewamo, Sebewa, and Wunabuna soils. Adrian, Edwards, Houghton, Madaus, Muskego, and Palms soils are very poorly drained organic soils.

Unless they are artificially drained, the somewhat poorly drained soils in Elkhart County are so wet that crop yields are reduced in most years. Crop damage results from late planting, root damage, and late harvest. Blount, Brady, Crosier, Del Rey, Morocco, and Selfridge soils are somewhat poorly drained. Brems, Bronson, Glynwood, and Williamstown soils are moderately well drained. Natural drainage is adequate in most years in moderately well drained soils, but artificial drainage is needed in some small areas along drainageways and swales.

In most areas of somewhat poorly drained, poorly drained, and very poorly drained soils, a combination of surface drainage and subsurface drainage is needed if the soils are used for intensive row cropping. Random tile drainage is generally adequate for moderately well drained soils. Finding adequate outlets for a tile drainage system is difficult in many areas of Adrian, Edwards, Houghton, Madaus, Muskego, Palms, and Pewamo soils. These soils are in depressions and potholes where ponding occurs and where suitable gravity outlets are not readily available. Many of these soils cannot be drained economically. Pumping stations can be used in some areas where a gravity outlet is not available. These soils have a low soil temperature and are subject to extended periods of frost, which hinder seed germination and may kill young plants. Drains should be more closely spaced in soils that have slow permeability than in soils that are more permeable. Drainage ditches may need to be deep and may extend a great distance to reach a suitable outlet.

Special management may be needed in areas of organic soils, such as Adrian, Edwards, Houghton, Madaus, Muskego, and Palms soils. Drainage aerates the soils, and the aeration increases oxidation. As a result, the soils subside. Special systems are needed to control the depth and period of drainage. The water table is lowered during the growing season for crop production and raised to the surface at other times to minimize oxidation and subsidence. Because of variations in the degree of decomposition and in the origin of the parent material, internal water movement may not be uniform. As a result, achieving uniform drainage throughout a field may be difficult. Information regarding proper drainage methods for each type of soil in the county is available at the local office of the Natural Resources Conservation Service. Strict Federal and State regulations apply to certain drainage activities involving wetlands (U.S. Army Corps of Engineers, 1987). Draining or filling wetlands is prohibited in most situations. The clearing of wooded wetlands also is prohibited. The local office of the Natural Resources Conservation Service or the U.S. Army Corps of Engineers should be consulted before any work that will affect wetlands is done.

Soil fertility refers to the amount of nutrients available to the plants. The natural fertility of soils varies depending on their physical and chemical properties. Most of the soils on uplands and terraces, such as Bristol, Coloma, Miami, and Tyner soils, have low natural fertility because the nutrients have been leached away. The soils in depressions and on bottom land, such as Adrian, Edwards, Houghton, Madaus, Muskego, Palms, and Pewamo soils, have higher natural fertility because they receive runoff from adjacent soils and have had less nutrient leaching.

The natural fertility of soils can be changed by adding fertilizer or lime or both to increase the available nutrients and raise the pH level of the soil. If crops are continually harvested from the soil and no fertilizer is added, the available nutrients are reduced and the pH is lowered. On all soils, additions of lime and fertilizer, including applications of manure, should be based on the results of soil tests, on the needs of the crop, and on the expected level of yields. The Cooperative Extension Service can help in determining the kind and amount of fertilizer and/or lime to be applied.

Soil tilth is an important factor affecting the preparation of a seedbed, the germination of seeds, and the infiltration of water into the soil. Soils that have good tilth are granular and porous. Some of the soils in Elkhart County have a coarse textured surface layer and are porous.

Many of the soils in the survey area have a surface layer of silt loam, sandy loam, or loam and have fair or poor tilth. Intense rainfall results in the formation of a crust on the surface of these soils. Once a hard crust forms, the rate of water infiltration is reduced and the runoff rate is increased. Regular additions of crop residue, manure, and other organic material improve tilth and help to prevent the formation of a crust. Excessive tillage tends to compact the soil, breaking down soil structure and tilth, especially when the soils are wet. Applying a system of conservation tillage and tilling only when moisture conditions are favorable minimize the amount of damage resulting from compaction. An adequate drainage system and timely fieldwork help to prevent crusting and minimize compaction.

Fall plowing is generally not a good practice in most areas of the county, especially on sloping soils that are subject to erosion. However, the dark, very poorly drained Milford and Pewamo soils and the somewhat

poorly drained Blount soils have a clayey subsoil, and tilth is a problem because the soils commonly stay wet until late spring. If plowed when wet, these soils tend to be very cloddy when dry. The cloddiness makes preparing a good seedbed difficult. Fall plowing on these soils generally results in good tilth in the spring.

Cropland Management Considerations

The management concerns affecting the use of the soils in the survey area for crops are shown in table 6. The main concerns in managing nonirrigated cropland are controlling erosion, soil wetness, and ponding; minimizing surface crusting; improving tilth; and minimizing the effects of excessive or restricted permeability and a limited available water capacity.

Generally, a combination of several practices is needed to control *wind erosion* and *water erosion.* Conservation tillage, stripcropping, field windbreaks, contour farming, conservation cropping systems, crop residue management, diversions, and grassed waterways help to prevent excessive soil loss.

Wetness is a limitation in some areas used for crops, and *ponding* also is a management concern in some areas. Drainage systems consist of subsurface tile drains, surface inlet tile, open drainage ditches, or a combination of these. Measures that maintain the drainage system are needed.

Practices that minimize *surface crusting* and improve *tilth* include incorporating green manure crops, manure, or crop residue into the soil and using a system of conservation tillage. Surface cloddiness can be minimized by avoiding tillage during periods when the soils are too wet.

Measures that conserve moisture are needed in areas where the soils have a *limited available water capacity*. These measures involve reducing the evaporation and runoff rates and increasing the rate of water infiltration. Applying conservation tillage and conservation cropping systems, farming on the contour, stripcropping, establishing field windbreaks, and leaving crop residue on the surface conserve moisture.

Most of the soils in the county, except for soils on flood plains, have a naturally low pH level in the surface layer. Measures that increase the pH level may be needed if crops are to be grown in areas of these soils. Also, soils in which the pH level is high may need treatment so that certain elements are adequately available for crop growth.

Some of the considerations shown in the table cannot be easily overcome. These are *flooding, limited rooting depth, restricted permeability,* and *subsidence*.

Winter-grown small grain crops are likely to be damaged after flooding events. Water-tolerant species should be selected in areas that are subject to frequent flooding during the growing season.

Following is an explanation of the criteria used in determining the limitations and hazards listed in table 6.

Crusting.—The content of organic matter in the surface layer is less than 2 percent, the percent passing the number 200 sieve is more than 50 percent, and the content of clay is less than 32 percent.

Excessive permeability.—Permeability is more than 6 inches per hour in one or more layers between the surface and a depth of 40 inches.

Flooding.—The soil is subject to occasional or frequent flooding during the growing season.

High pH.—The soil has a typical pH value that is equal to or higher than 7.4 in the surface layer.

Limited rooting depth.—Bedrock or a fragipan is within a depth of 40 inches.

Low available water capacity or *moderate available water capacity*.—The available water capacity (weighted average) calculated to a depth of 60 inches or to a root-limiting layer is 0.15 inch or less.

Low pH.—The soil has a typical pH value that is equal to or less than 6.0 in the surface layer.

Ponding.—The soil is subject to ponding during the growing season (fig. 12).

Poor tilth.—The soil has 32 percent or more clay in the surface layer.

Restricted permeability.—Permeability is less than 0.2 inch per hour in one or more layers between the surface and a depth of 40 inches.

Water erosion.—Either the slope is 6 percent or more, or the slope is more than 3 percent and less than 6 percent and the surface layer is not sandy.

Wetness.—The soil has a water table within a depth of 1.5 feet during the growing season.

Wind erosion.—The wind erodibility group is 1 or 2 for soils on flood plains; for other soils, the wind erodibility group is 3.

Pasture Management Considerations

Forage crops for hay and pasture are suited to the soils and climate of Elkhart County. Alfalfa is the most commonly grown legume in the county. It is well adapted to the climate and well suited to the sloping, well drained soils, such as Bristol and Miami soils. It can be grown on the very poorly drained soils, such as Brookston and Pewamo soils, if adequate drainage is available. Other forage crops typically grown in the county are sudangrass, orchardgrass, tall fescue,

Figure 12.—Ponding of water can cause crop damage in areas of Gilford sandy loam, 0 to 1 percent slopes.

timothy, smooth bromegrass, and Kentucky bluegrass. Reed canarygrass and tall fescue are grown on poorly drained and very poorly drained soils.

Pasture and hayland are important in Elkhart County because of the large number of horses and cattle. Measures that prevent overgrazing help to protect the plant cover and thus reduce the runoff rate and the hazard of erosion. Grazing when the soils are wet results in compaction and poor forage production. Also, allowing grazing in areas of woodland reduces the value of timber that can be sold from a woodlot.

Growing legumes, cool-season grasses, and warm-season grasses that are suited to the soils and the climate of the area helps to maintain a productive stand of pasture.

The productivity of a pasture and its ability to protect the soil are influenced by the number of livestock in the pasture, the length of time the animals graze, and the distribution of rainfall. Good pasture management includes proper stocking rates, rotation grazing, and deferred grazing. More information on pasture management is available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

The management concerns affecting the use of the soils in the survey area for pasture are shown in table 7. The major management concerns affecting pasture are water erosion, equipment limitations, wetness and ponding, and a low available water capacity.

The majority of the soils in Elkhart County that are suitable for growing legumes have a high potential for frost action. The local office of the Natural Resources Conservation Service or the Cooperative Extension Service can provide information about legumes subject to damage from frost heave. This hazard is not listed in the table because it applies to the majority of the soils in the survey area.

Water erosion and wind erosion reduce the productivity of pastureland. Erosion also results in onsite and offsite sedimentation, causes water pollution by sedimentation, and increases the runoff of

livestock manure and other added nutrients. Measures that are effective in controlling water erosion include establishing or renovating stands of legumes and grasses. Controlling erosion during seedbed preparation is a major concern. If the soil is tilled for the reseeding of pasture or hay crops, planting winter cover crops, establishing grassed waterways, farming on the contour, and using a system of conservation tillage that leaves a protective cover of crop residue on the surface can help to control erosion.

Overgrazing or grazing when the soil is wet reduces the extent of plant cover and results in surface compaction and poor tilth, and thus it increases the susceptibility to erosion. Proper stocking rates, rotation grazing, and timely deferment of grazing, especially during wet periods, help to keep the pasture in good condition. The proper location of livestock watering facilities helps to prevent surface compaction or the formation of ruts.

In areas where slopes are 15 percent or more, the use of farm equipment may be restricted and may even become hazardous. Also, rock fragments in the surface layer of the soils limit the type of equipment that can be used or can damage equipment during reseeding and planting.

Soils that have bedrock or a fragipan within a depth of 40 inches have a restricted rooting depth and a limited available water capacity.

Available water capacity refers to the capacity of soils to hold water available for use by most plants. The quality and quantity of the pasture may be reduced in areas of soils that have a low available water capacity and may be inadequate for the maintenance of a healthy community of desired pasture species and, thus, the desired number of livestock. A poor quality pasture may increase the hazard of erosion and increase the runoff of pollutants. Planting drought-resistant species of grasses and legumes helps to establish a cover of vegetation. Irrigation may be needed.

Wetness is a limitation in some areas used for pasture. Ponding also is a hazard in some areas. Drainage systems consist of subsurface tile drains, surface inlet tile, open drainage ditches, or a combination of these. Measures that maintain the drainage system are needed.

Low or high pH inhibits the uptake of certain nutrients by the plants or accelerates the absorption of certain other elements to the level of toxic concentrations. Either of these conditions affects the health and vigor of plants. If the pH is low, applications of lime may be needed. The applications should be based on the results of soil tests. The goal is to achieve the optimum pH level for the uptake of the major nutrients by the specific grass, legume, or combination of grasses and legumes.

Some of the limitations and hazards shown in the table, such as flooding, cannot be easily overcome.

Following is an explanation of the criteria used to determine the limitations and hazards listed in the table.

Equipment limitation.—The slope is 15 percent or more.

Flooding.—The soil is subject to occasional or frequent flooding during the growing season.

High pH.—The soil has a typical pH value that is equal to or higher than 7.4 in the surface layer.

Low available water capacity or *moderate available water capacity*.—The available water capacity (weighted average) calculated to a depth of 60 inches is 0.1 inch or less, or it is less than 3 inches in the root zone if the root zone is less than 60 inches thick.

Low pH.—The soil has a typical pH value that is equal to or less than 6.0 in the surface layer.

Ponding.—The soil is subject to ponding during the growing season.

Water erosion.—The K factor multiplied by the slope is greater than 0.8, and the slope is 3 percent or more.

Wetness.—The soil is poorly drained or very poorly drained.

Wind erosion.—The wind erodibility group is 1 or 2 for soils on flood plains; for other soils, the wind erodibility group is 3.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 8. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of map units in the survey area also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations also are considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects;

favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in the table are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit (USDA, 1961). Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class 1 soils have few limitations that restrict their use.

Class 2 soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class 3 soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class 5 soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class 6 soils have severe limitations that make them generally unsuitable for cultivation.

Class 7 soils have very severe limitations that make them unsuitable for cultivation.

Class 8 soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, 2e. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class 1 there are no subclasses because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by *w, s,* or *c* because the soils in class 5 are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

The capability classification of map units in this survey area is given in table 8.

Prime Farmland

Randy Franks, district conservationist, Natural Resources Conservation Service, and Darrell E. Brown, conservation agronomist, Natural Resources Conservation Service, helped prepare this section.

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation’s short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation’s prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land,

pastureland, forest land, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. Slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

About 116,000 acres in Elkhart County, or nearly 37 percent of the total acreage, meets the criteria for prime farmland. This land is primarily distributed throughout the southern two-thirds of the county. Urban encroachment has claimed about 17,000 acres of prime farmland in recent years. About 99,000 acres of prime farmland is used for crops. The main crops are corn, soybeans, small grain, alfalfa, and pasture.

The map units in the survey area that are considered prime farmland are listed in table 9. This list does not constitute a recommendation for a particular land use. On some soils included in the list, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in table 5. The location is shown on the detailed soil maps. The soil qualities that affect use and management are described under the heading “Soil Series and Detailed Soil Map Units.”

Erosion Factors

Soil erodibility (K) and soil-loss tolerance (T) factors are used in an equation that predicts the amount of soil lost through water erosion in areas of cropland. The procedure for predicting soil loss is useful in guiding the selection of soil and water conservation practices. The erosion factors are shown in table 19.

Soil Erodibility (K) Factor

The soil erodibility (K) factor indicates the susceptibility of a soil to sheet and rill erosion by water. The soil properties that influence erodibility are those that affect the infiltration rate, the movement of water through the soil, and the water storage capacity of the soil and those that allow the soil to resist dispersion, splashing, abrasion, and the transporting forces of rainfall and runoff. The most important soil properties are the content of silt plus very fine sand, the content of sand coarser than very fine sand, the content of organic matter, soil structure, and permeability.

Fragment-Free Soil Erodibility (Kf) Factor

This is one of the factors used in the Revised Universal Soil Loss Equation. It shows the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Soil-Loss Tolerance (T) Factor

The soil-loss tolerance (T) factor is an estimate of the maximum annual rate of soil erosion that can occur over a sustained period without affecting crop productivity. The rate is expressed in tons of soil loss per acre per year. Ratings of 1 to 5 are used, depending on soil properties and prior erosion. The criteria used in assigning a T factor to a soil include maintenance of an adequate rooting depth for crop production, potential reduction of crop yields, maintenance of water-control structures affected by sedimentation, prevention of gullying, and the value of nutrients lost through erosion.

Wind Erodibility Groups

Wind erodibility is directly related to the percentage of dry, nonerodible surface soil aggregates larger than 0.84 millimeter in diameter. From this percentage, the wind erodibility index (I) factor is determined. This factor is an expression of the stability of the soil aggregates, or the extent to which they are broken down by tillage and the abrasion caused by windblown soil particles. Soils are assigned to wind erodibility groups (WEG) having similar percentages of dry soil aggregates larger than 0.84 millimeter. The wind erodibility groups are listed in table 19.

Additional information about wind erodibility groups and K, Kf, T, and I factors can be obtained from local offices of the Natural Resources Conservation Service or the Cooperative Extension Service.

Hydric Soils

In this section, hydric soils are defined and described and the hydric soils in the survey area are listed.

The three essential characteristics of wetlands are hydrophytic vegetation, hydric soils, and wetland

hydrology (Cowardin and others, 1979; U.S. Army Corps of Engineers, 1987; National Research Council, 1995; Tiner, 1985). Criteria for each of the characteristics must be met for areas to be identified as wetlands. Undrained hydric soils that have natural vegetation should support a dominant population of ecological wetland plant species. Hydric soils that have been converted to other uses should be capable of being restored to wetlands.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). These soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 1995). These criteria are used to identify a phase of a soil series that normally is associated with wetlands. The criteria used are selected estimated soil properties that are described in “Soil Taxonomy” (Soil Survey Staff, 1999) and “Keys to Soil Taxonomy” (Soil Survey Staff, 1996) and in the “Soil Survey Manual” (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils in this survey area are specified in “Field Indicators of Hydric Soils in the United States” (Hurt and others, 1998).

Hydric soils are identified by examining and describing the soil to a depth of about 20 inches. This depth may be greater if determination of an appropriate indicator so requires. It is always recommended that soils be excavated and described to the depth necessary for an understanding of the redoximorphic processes. Then, using the completed soil descriptions, soil scientists can compare the soil features required by each indicator and specify which indicators have been matched with the conditions observed in the soil. The soil can be identified as a hydric soil if at least one of the approved indicators is present.

The following map units meet the definition of hydric soils and, in addition, have at least one of the hydric soil indicators. This list can help in planning land uses; however, onsite investigation is recommended to determine the hydric soils on a specific site (National Research Council, 1995; Hurt and others, 1998).

AbhAN—Adrian muck, drained, 0 to 1 percent slopes
AbhAU—Adrian muck, undrained, 0 to 1 percent slopes
BuuA—Brookston loam, 0 to 1 percent slopes
EchAN—Edwards muck, drained, 0 to 1 percent slopes
EchAU—Edwards muck, undrained, 0 to 1 percent slopes
GczA—Gilford sandy loam, 0 to 1 percent slopes
GdnA—Gilford mucky sandy loam, 0 to 1 percent slopes
GndA—Granby loamy sand, 0 to 1 percent slopes
GocAK—Gravelton loam, 0 to 1 percent slopes, occasionally flooded, brief duration
GodAI—Gravelton loam, 0 to 1 percent slopes, frequently flooded, long duration
HhaAP—Histosols, 0 to 1 percent slopes, ponded
HtbAN—Houghton muck, drained, 0 to 1 percent slopes
HtbAU—Houghton muck, undrained, 0 to 1 percent slopes
MfrAN—Madaus muck, drained, 0 to 1 percent slopes
MgcA—Maumee loamy sand, 0 to 1 percent slopes
MouAN—Milford silty clay loam, 0 to 1 percent slopes
MwzAN—Muskego muck, drained, 0 to 1 percent slopes
MwzAU—Muskego muck, undrained, 0 to 1 percent slopes
PaaAN—Palms muck, drained, 0 to 1 percent slopes
PkdA—Pewamo clay loam, 0 to 1 percent slopes
ReyAN—Rensselaer loam, 0 to 1 percent slopes
ScuA—Sebewa loam, 0 to 1 percent slopes
SdnA—Sebewa mucky loam, 0 to 1 percent slopes
SnlA—Southwest silt loam, 0 to 1 percent slopes
UgrA—Urban land-Rensselaer complex, 0 to 1 percent slopes (Rensselaer component)
WcnAI—Waterford loam, 0 to 2 percent slopes, frequently flooded, long duration
WrxAN—Wunabuna silt loam, drained, 0 to 1 percent slopes

Map units that are made up of hydric soils may have small areas, or inclusions, of nonhydric soils in the higher positions on the landform, and map units

made up of nonhydric soils may have inclusions of hydric soils in the lower positions on the landform.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 10 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in the table are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from the local office of the Natural Resources Conservation Service or of the Cooperative Extension Service or from a commercial nursery.

Forestland

In 1994, Elkhart County had 19,783 acres of woodland. This acreage consisted of tracts of 5 acres or more (fig. 13).

Table 11 can help woodland owners or forest managers plan the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity (Eyre, 1980; USDA, National Forestry Manual).

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce in a pure stand under natural conditions. The number 1 indicates low potential productivity; 2 or 3, moderate; 4 or 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excess water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; *F*, a high content of rock fragments in the soil; *L*, low strength; and *N*, snowpack. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, F, L, and N.

In table 11, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, and fire lanes and in log-handling areas. Forests that have been burned or overgrazed also are subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *slight* indicates that under normal conditions the kind of equipment and season of use are not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of *severe* indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic

Figure 13.—A stand of timber in an area of Waterford loam, 0 to 2 percent slopes, frequently flooded, long duration.

conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

Plant competition ratings indicate the degree to which undesirable species are expected to invade and grow when openings are made in the tree canopy. The main factors that affect plant competition are depth to the water table and the available water capacity. A rating of *slight* indicates that competition from undesirable plants is not likely to prevent natural regeneration or suppress the more desirable species. Planted seedlings can become established without undue competition. A rating of *moderate* indicates that competition may delay the establishment of desirable species. Competition may hamper stand development, but it will not prevent the eventual development of fully stocked stands. A rating of *severe* indicates that competition can be expected to prevent regeneration unless precautionary measures are applied.

The *potential productivity* of merchantable or

common trees on a soil is expressed as a *site index* and as a *volume* number. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *volume*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic feet per acre per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

The first species listed under *common trees* for a soil is the indicator species for that soil. It generally is the most common species on the soil and is the one that determines the ordination class.

Suggested trees to plant are those that are suitable for commercial wood production.

Recreation

The soils of the survey area are rated in table 12 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation also are important. Soils that are subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In the table, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or a combination of these.

The information in table 12 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 15 and interpretations for dwellings without basements and for local roads and streets in table 14.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting

appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 13, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible (Allan and others, 1963).

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture also are considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture also are considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture also are considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggartick, wildrye, and sedge.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, and hickory. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous and/or coniferous plants and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife

attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Another important kind of wildlife habitat is *edge habitat.* This type of habitat consists of areas where major land uses or cover types adjoin. An example is the border between dense woodland and a field of no-till corn. Edge habitat is not rated in table 13, but it is of primary importance to a wide variety of animals in the survey area, ranging from the smallest songbirds to white-tailed deer. Most of the animals that inhabit openland or woodland areas also frequent areas of edge habitat.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the data in the tables described under the heading “Soil Properties.”

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 14 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, or other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense

layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils (fig. 14). A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the

Figure 14.—New home construction in an area of Tyner loamy sand, 0 to 1 percent slopes. Poor filtering properties and droughtiness are concerns affecting the use of this soil for residential development.

surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 15 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

The table also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

The table gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in the table are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, rock fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 16 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 16, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a

water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 17 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, and sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are

affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind erosion or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts and sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

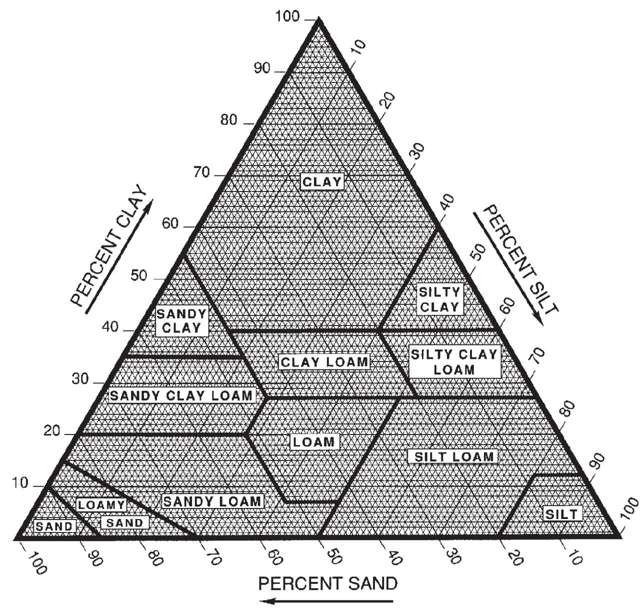

Figure 15.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

Table 18 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading “Soil Series and Detailed Soil Map Units.”

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 15). “Loam,” for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, “gravelly.” Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2001) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2000).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical Properties

Table 19 shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In the table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $^{1}/_{3}$- or $^{1}/_{10}$-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability (K_{sat}) refers to the ability of a soil to transmit water or air. The term “permeability,” as used in soil surveys, indicates saturated hydraulic conductivity (K_{sat}). The estimates in the table indicate the rate of water movement, in inches per hour, when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water

capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at $^{1}/_{3}$- or $^{1}/_{10}$-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. Volume change is influenced by the amount and type of clay minerals in the soil.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Erosion factors are shown in table 19 as the K factor (Kw and Kf) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of several factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and permeability. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are as follows:

1. Coarse sands, sands, fine sands, and very fine sands.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, ash material, and sapric soil material.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material.

8. Soils that are not subject to wind erosion because of rock fragments on the surface or because of surface wetness.

Chemical Properties

Table 20 shows estimates of some chemical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Soil reaction is a measure of acidity or alkalinity. The pH of each soil horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 20, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained by returning crop residue to the soil. Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Cation-exchange capacity is the total amount of extractable bases that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. Soils having a low cation-exchange capacity

hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. The ability to retain cations reduces the hazard of ground-water pollution.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients is influenced by the amount of carbonates in the soil. Incorporating nitrogen fertilizer into calcareous soils helps to prevent nitrite accumulation and ammonium-N volatilization.

Water Features

Table 21 gives estimates of various water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

The table gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of flooding is more than 50 percent in any year). Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on observations of the water table at selected sites and on the evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. Indicated in the table are depth to the seasonal high water table, the kind of water table, and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in the table.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a

saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. “More than 6.0” indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. *Ponding duration* classes are the same as those for flooding. *Maximum ponding depth* refers to the depth of the water above the surface of the soil.

Soil Features

Table 22 gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence generally results from either desiccation and shrinkage or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. The table shows the expected initial subsidence, which usually is a result of drainage, and total subsidence, which results from a combination of factors.

Potential for frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low, moderate,* or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

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Glossary

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Alpha,alpha-dipyridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redoximorphic feature.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction in which a slope faces.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Backslope. The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Backswamp. An extensive marshy or swampy depressed area on flood plains between natural levees and valley sides or terraces.

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedding system. A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bedrock-floored plain. An extensive nearly level to gently rolling or moderately sloping area that is underlain by hard bedrock and has slopes of 0 to 8 percent.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or

cobbles. In some blowouts the water table is exposed.

Board foot. A unit of measure of the wood in lumber, logs, or trees. The amount of wood in a board 1 foot wide, 1 foot long, and 1 inch thick before finishing.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breast height. An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or “chain,” of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Cement rock. Shaly limestone used in the manufacture of cement.

Channeled. Refers to a drainage area in which natural meandering or repeated branching and convergence of a streambed have created deeply incised cuts, either active or abandoned, in alluvial material.

Channery soil material. Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Clearcut. A method of forest harvesting that removes the entire stand of trees in one cutting. Reproduction is achieved artificially or by natural seeding from adjacent stands.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Clod. A compact, coherent mass of soil of variable size, typically produced by plowing, digging, or other mechanical means, especially when these activities take place in areas where the soils are too wet or too dry, and normally formed by compression or breaking off from a larger unit.

Closed depression. A low area completely surrounded by higher ground and having no natural outlet.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Codominant trees. Trees whose crowns form the general level of the forest canopy and that receive full light from above but comparatively little from the sides.

COLE (coefficient of linear extensibility). See Linear extensibility.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Conglomerate. A coarse grained, clastic rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."

Consolidated sandstone. Sandstone that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very hard when dry, are not easily crushed, and cannot be textured by the usual field method.

Consolidated shale. Shale that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very hard when dry and are not easily crushed.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth

is called the culmination of the mean annual increment.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Delta. A body of alluvium having a surface that is nearly flat and fan shaped; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Dip slope. A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divided-slope farming. A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit a full stripcropping pattern to be used.

Dominant trees. Trees whose crowns form the general level of the forest canopy and that receive full light from above and from the sides.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the "Soil Survey Manual."

Drainage, surface. Runoff, or surface flow of water, from an area.

Drainageway. An area of ground at a lower elevation than the surrounding ground and in which water collects and is drained to a closed depression or lake or to a drainageway at a lower elevation. A drainageway may or may not have distinctly incised channels at its upper reaches or throughout its course.

Draw. A small stream valley that generally is more open and has broader bottom land than a ravine or gulch.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Dune. A low mound, ridge, bank, or hill of loose, windblown granular material (generally sand), either bare or covered with vegetation, capable of movement from place to place but always maintaining its characteristic shape.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.

Even aged. Refers to a stand of trees in which only small differences in age occur between the individuals. A range of 20 years is allowed.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fan terrace. A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. An area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flaggy soil material. Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flat. A general term for a level or nearly level surface or small area of land marked by little or no relief.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Flood-plain step. An essentially flat alluvial surface within a valley that is frequently covered by floodwater from the present stream; any approximately horizontal surface frequently modified by scour and/or deposition. May occur individually or as a series of steps.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Footslope. The position that forms the inner, gently inclined surface at the base of a hillslope. In profile, footslopes are commonly concave. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift. Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits. Material moved by glaciers

and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head out. To form a flower head.

Head slope. A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

Heavy metal. Inorganic substances that are solid at ordinary temperatures and are not soluble in water. They form oxides and hydroxides that are basic. Examples are copper, iron, cadmium, zinc, manganese, lead, and arsenic.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the “Soil Survey Manual.” The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material.

The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Interdune. The relatively flat surface, whether covered with sand or free of sand, between dunes.

Interfluve. An elevated area between two drainageways that sheds water to those drainageways.

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

Irrigation. Application of water to soils to assist in production of crops. Some methods of irrigation are:

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Kame. An irregular, short ridge or hill of stratified glacial drift.

Kame terrace. A terracelike ridge consisting of stratified sand and gravel that were deposited by a meltwater stream flowing between a melting glacier and a higher valley wall or lateral moraine and that remained after the disappearance of the ice. It is commonly pitted with kettles and has an irregular ice-contact slope.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake plain. A surface marking the floor of an extinct lake, filled in by well sorted, stratified sediments.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Leaching. The removal of soluble material from soil or other material by percolating water.

Linear extensibility. Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at $^1/_3$- or $^1/_{10}$-bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Major land resource area (MLRA). Geographically associated land resource units made up of nearly homogeneous areas of land use, elevation, topography, climate, water resources, potential natural vegetation, and soils. MLRAs are most useful for statewide agricultural planning and have value for interstate, regional, and national planning. They are designated by numbers and descriptive geographic names.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Mean annual increment (MAI). The average annual increase in volume of a tree during the entire life of the tree.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Merchantable trees. Trees that are of sufficient size to be economically processed into wood products.

Mesa. A broad, nearly flat topped and commonly isolated upland mass characterized by summit widths that are more than the heights of bounding erosional scarps.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Microhigh. An area that is 2 to 12 inches higher than the adjacent microlow.

Microlow. An area that is 2 to 12 inches lower than the adjacent microhigh.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine. An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as

follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon. A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Nose slope. A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Overstory. The trees in a forest that form the upper crown cover.

Oxbow. The horseshoe-shaped channel of a former meander, remaining after the stream formed a cutoff across a narrow meander neck.

Paleosol. A soil that formed on a landscape in the past with distinctive morphological features resulting from a soil-forming environment that no longer exists at the site. The former pedogenic process was either altered because of external environmental change or interrupted by burial.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Pararock fragments. Fragments of paralithic materials having a diameter of 2 millimeters or more; for example, parachanners and paraflagstones.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment. A thin layer of alluvial material that mantles an erosion surface and has been transported to its present position from higher lying areas of the erosion surface.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms

describing permeability, measured in inches per hour, are as follows:

Extremely slow	0.0 to 0.01 inch
Very slow	0.01 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plateau. An extensive upland mass with relatively flat summit area that is considerably elevated (more than 100 meters) above adjacent lowlands and separated from them on one or more sides by escarpments.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Quartzite, metamorphic. Rock consisting mainly of quartz that formed through recrystallization of quartz-rich sandstone or chert.

Quartzite, sedimentary. Very hard but unmetamorphosed sandstone consisting chiefly of quartz grains.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

Regeneration. The new growth of a natural plant community, developing from seed.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relict stream terrace. One of a series of platforms in or adjacent to a stream valley that formed prior to the current stream system.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

Riser. The relatively short, steep area below a terrace tread that grades to a lower terrace tread or base level.

Riverwash. Unstable areas of sandy, silty, clayey, or gravelly sediments. These areas are flooded, washed, and reworked by rivers so frequently that they support little or no vegetation.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Sawlogs. Logs of suitable size and quality for the production of lumber.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Scarp. An escarpment, cliff, or steep slope of some extent along the margin of a plateau, mesa, terrace, or structural bench. A scarp may be of any height.

Second bottom. The first terrace above the normal flood plain (or first bottom) of a river.

Sedimentary plain. An extensive nearly level to gently rolling or moderately sloping area that is underlain by sedimentary bedrock and that has slopes of 0 to 8 percent.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Semiconsolidated sedimentary beds. Soft geologic sediments that disperse when fragments are placed in water. The fragments are hard or very hard when dry. Determining the texture by the usual field method is difficult.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of

soil material from the land surface by the action of rainfall and surface runoff.

Shoulder. The position that forms the uppermost inclined surface near the top of a hillslope. It is a transition from backslope to summit. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Side slope. A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Skid trails. Pathways along which logs are dragged to a common site for loading onto a logging truck.

Slash. The branches, bark, treetops, reject logs, and broken or uprooted trees left on the ground after logging.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, classes for simple slopes are as follows:

Level	0 to 1 percent
Nearly level	0 to 3 percent
Very gently sloping	1 to 3 percent
Gently sloping	2 to 6 percent
Moderately sloping	6 to 12 percent
Strongly sloping	12 to 18 percent
Moderately steep	18 to 25 percent
Steep	25 to 35 percent
Very steep	35 percent and higher

Classes for complex slopes are as follows:

Level	0 to 1 percent
Nearly level	0 to 3 percent
Gently undulating	1 to 4 percent
Undulating	1 to 8 percent
Gently rolling	4 to 10 percent
Rolling	4 to 16 percent
Hilly	10 to 30 percent
Steep	20 to 60 percent
Very steep	45 percent and higher

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief and by the passage of time.

Soil quality. The fitness of a specific kind of soil to function within its surroundings, support plant and animal productivity, maintain or enhance water quality and air quality, and support human health and habitation.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging

between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of rock fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Strath terrace. A type of stream terrace that formed as an erosional surface cut on bedrock and that is thinly mantled with stream deposits (alluvium).

Stream channel. The hollow bed where a natural stream of surface water flows or may flow; the deepest or central part of the bed, formed by the main current and covered more or less continuously by water.

Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel. It originally formed near the level of the stream and is the dissected remnants of an abandoned flood plain, streambed, or valley floor that were produced during a former stage of erosion or deposition.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structural bench. A platform-like, nearly level to gently inclined erosional surface developed on resistant strata in areas where valleys are cut in alternating strong and weak layers with an essentially horizontal attitude. Structural benches are bedrock controlled and, in contrast to stream terraces, have no geomorphic implication of former partial erosion cycles and base-level controls, nor do they represent a stage of flood-plain development following an episode of valley trenching.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Summit. The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the “plow layer,” or the “Ap horizon.”

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only

when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Till plain. An extensive area of nearly level to undulating soils underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The position that forms the gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Trafficability. The degree to which a soil is capable of supporting vehicular traffic across a wide range in soil moisture conditions.

Tread. The relatively flat terrace surface that was cut or built by stream or wave action.

Understory. Any plants in a forest community that grow to a height of less than 5 feet.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley. An elongated depressional area primarily developed by stream action.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Waterspreading. Diverting runoff from natural channels by means of a system of dams, dikes, or ditches and spreading it over relatively flat surfaces.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The uprooting and tipping over of trees by the wind.

Tables

Table 1.--Temperature and Precipitation

(Recorded in the period 1961-90 at Goshen College, Indiana)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	^{o}F	^{o}F	^{o}F	^{o}F	^{o}F	Units	In	In	In		In
January----	30.3	15.6	23.0	56	-16	7	1.60	0.76	2.33	4	9.4
February---	34.4	18.0	26.2	58	-11	12	1.61	.79	2.32	4	8.5
March------	46.4	28.6	37.5	77	2	98	2.72	1.67	3.67	6	5.3
April------	60.0	38.6	49.3	84	17	301	3.40	2.16	4.52	7	1.7
May--------	71.1	48.5	59.8	90	29	614	3.19	2.21	4.09	6	.0
June-------	80.6	58.1	69.3	95	40	879	3.69	2.17	5.06	6	.0
July-------	83.9	62.1	73.0	97	46	1,022	3.62	1.86	5.16	5	.0
August-----	81.4	59.9	70.7	95	42	951	3.72	1.92	5.29	6	.0
September--	74.7	53.3	64.0	91	34	720	3.45	1.92	5.02	6	.0
October----	62.8	42.4	52.6	84	22	398	2.76	1.39	3.95	6	.6
November---	49.0	33.3	41.1	73	14	131	2.75	1.62	3.76	6	3.7
December---	35.2	21.9	28.5	61	-7	23	2.74	1.47	3.85	6	9.2
Yearly:											
Average---	59.2	40.0	49.6	---	---	---	---	---	---	---	---
Extreme---	102	-24	---	98	-17	---	---	---	---	---	---
Total-----	---	---	---	---	---	5,156	35.27	29.66	39.86	68	38.4

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F).

Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1961-90 at Goshen College, Indiana)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 18	May 2	May 18
2 years in 10 later than--	Apr. 14	Apr. 27	May 13
5 years in 10 later than--	Apr. 6	Apr. 17	May 3
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 25	Oct. 8	Sept. 27
2 years in 10 earlier than--	Oct. 30	Oct. 14	Oct. 2
5 years in 10 earlier than--	Nov. 8	Oct. 24	Oct. 11

Table 3.--Growing Season

(Recorded in the period 1961-90 at Goshen College, Indiana)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	196	167	142
8 years in 10	203	174	149
5 years in 10	215	188	161
2 years in 10	227	202	173
1 year in 10	233	209	179

Table 4.--Classification of the Soils

(The classifications in this survey do not reflect recent amendments to soil taxonomy for cation-exchange activity, particle-size modifier, and dual mineralogy for strongly contrasting classes. For more detailed information, contact the local office of the Natural Resources Conservation Service)

Soil name	Family or higher taxonomic class
Abscota	Mixed, mesic Oxyaquic Udipsamments
Adrian	Sandy or sandy-skeletal, mixed, euic, mesic Terric Haplosaprists
Bainter	Coarse-loamy, mixed, semiactive, mesic Mollic Hapludalfs
Baugo	Fine-loamy, mixed, semiactive, mesic Aeric Epiaqualfs
Blount	Fine, illitic, mesic Aeric Epiaqualfs
Brady	Coarse-loamy, mixed, active, mesic Aquollic Hapludalfs
Brems	Mixed, mesic Aquic Udipsamments
Bristol	Mixed, mesic Psammentic Hapludalfs
Bronson	Coarse-loamy, mixed, active, mesic Aquic Hapludalfs
Brookston	Fine-loamy, mixed, superactive, mesic Typic Argiaquolls
Coloma	Mixed, mesic Lamellic Udipsamments
Cosperville	Fine, mixed, active, mesic Typic Hapludalfs
Crosier	Fine-loamy, mixed, active, mesic Aeric Epiaqualfs
Del Rey	Fine, illitic, mesic Aeric Epiaqualfs
Desker	Coarse-loamy, mixed, superactive, mesic Mollic Hapludalfs
Edwards	Marly, euic, mesic Limnic Haplosaprists
Gilford	Coarse-loamy, mixed, superactive, mesic Typic Endoaquolls
Glynwood	Fine, illitic, mesic Aquic Hapludalfs
Granby	Sandy, mixed, mesic Typic Endoaquolls
Gravelton	Sandy, mixed, mesic Fluvaquentic Endoaquolls
Histosols	Haplosaprists
Houghton	Euic, mesic Typic Haplosaprists
Jamestown	Fine-loamy, mixed, superactive, nonacid, mesic Aeric Epiaquepts
Kimmell	Fine, illitic, mesic Aeric Epiaqualfs
Madaus	Coarse-silty over sandy or sandy-skeletal, carbonatic over mixed, mesic Histic Humaquepts
Matherton	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Udollic Endoaqualfs
Maumee	Sandy, mixed, mesic Typic Endoaquolls
Metea	Loamy, mixed, active, mesic Arenic Hapludalfs
Miami	Fine-loamy, mixed, active, mesic Oxyaquic Hapludalfs
Milford	Fine, mixed, superactive, mesic Typic Endoaquolls
Mishawaka	Sandy, mixed, mesic Typic Hapludolls
Morocco	Mixed, mesic Aquic Udipsamments
Muskego	Coprogenous, euic, mesic Limnic Haplosaprists
Oshtemo	Coarse-loamy, mixed, active, mesic Typic Hapludalfs
Osolo	Mixed, mesic Typic Udipsamments
Palms	Loamy, mixed, euic, mesic Terric Haplosaprists
Pewamo	Fine, mixed, active, mesic Typic Argiaquolls
Psammaquents	Psammaquents
Psamments	Psamments
Rensselaer	Fine-loamy, mixed, superactive, mesic Typic Argiaquolls
Riddles	Fine-loamy, mixed, active, mesic Typic Hapludalfs
Sebewa	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Typic Argiaquolls
Selfridge	Loamy, mixed, active, mesic Aquic Arenic Hapludalfs
Southwest	Fine-silty, mixed, superactive, nonacid, mesic Typic Fluvaquents
Tyner	Mixed, mesic Typic Udipsamments
Udorthents	Udorthents
Vistula	Mixed, mesic Psammentic Hapludalfs
Volinia	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Pachic Argiudolls
Waterford	Coarse-loamy, mixed, active, mesic Fluvaquentic Eutrochrepts
Williamstown	Fine-loamy, mixed, active, mesic Aquic Hapludalfs
Wunabuna	Fine, mixed, superactive, nonacid, mesic Fluvaquentic Endoaquepts

Table 5.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
AahAK	Abscota loamy sand, 0 to 2 percent slopes, occasionally flooded, brief duration	1,058	0.4
AbhAN	Adrian muck, drained, 0 to 1 percent slopes	1,529	0.5
AbhAU	Adrian muck, undrained, 0 to 1 percent slopes	1,593	0.5
BaaA	Bainter sandy loam, 0 to 1 percent slopes	6,399	2.1
BaaB	Bainter sandy loam, 1 to 4 percent slopes	408	0.1
BbmA	Baugo silt loam, 0 to 1 percent slopes	1,421	0.5
BlaA	Blount loam, 0 to 1 percent slopes	3,922	1.3
BlaB	Blount loam, 1 to 4 percent slopes	860	0.3
BshA	Brady sandy loam, 0 to 1 percent slopes	7,049	2.4
BteA	Brems loamy sand, 0 to 1 percent slopes	3,367	1.1
BteB	Brems loamy sand, 1 to 4 percent slopes	74	*
BtxA	Bristol loamy sand, 0 to 2 percent slopes	9,789	3.3
BtxB	Bristol loamy sand, 2 to 5 percent slopes	9,914	3.3
BtxC	Bristol loamy sand, 5 to 10 percent slopes	6,371	2.1
BtxD2	Bristol loamy sand, 10 to 18 percent slopes, eroded	1,851	0.6
BtxE	Bristol loamy sand, 18 to 30 percent slopes	793	0.3
BufA	Bronson sandy loam, 0 to 1 percent slopes	3,989	1.3
BuuA	Brookston loam, 0 to 1 percent slopes	18,060	6.1
CnbA	Coloma sand, 0 to 2 percent slopes	4,586	1.5
CnbB	Coloma sand, 2 to 5 percent slopes	3,947	1.3
CnbC	Coloma sand, 5 to 10 percent slopes	1,943	0.7
CosA	Cosperville loam, 0 to 2 percent slopes	354	0.1
CosB	Cosperville loam, 2 to 5 percent slopes	193	*
CvdA	Crosier loam, 0 to 1 percent slopes	32,902	11.0
CvdB	Crosier loam, 1 to 4 percent slopes	25,150	8.4
DcrA	Del Rey silty clay loam, 0 to 1 percent slopes	576	0.2
DdeA	Desker sandy loam, 0 to 1 percent slopes	788	0.3
DdeB	Desker sandy loam, 1 to 6 percent slopes	372	0.1
EchAN	Edwards muck, drained, 0 to 1 percent slopes	936	0.3
EchAU	Edwards muck, undrained, 0 to 1 percent slopes	532	0.2
GczA	Gilford sandy loam, 0 to 1 percent slopes	8,660	2.9
GdnA	Gilford mucky sandy loam, 0 to 1 percent slopes	1,706	0.6
GlaB	Glynwood loam, 1 to 5 percent slopes	280	*
GlaC	Glynwood loam, 5 to 10 percent slopes	77	*
GndA	Granby loamy sand, 0 to 1 percent slopes	263	*
GocAK	Gravelton loam, 0 to 1 percent slopes, occasionally flooded, brief duration	181	*
GodAI	Gravelton loam, 0 to 1 percent slopes, frequently flooded, long duration	3,769	1.3
HhaAP	Histosols, 0 to 1 percent slopes, ponded	1,210	0.4
HtbAN	Houghton muck, drained, 0 to 1 percent slopes	1,849	0.6
HtbAU	Houghton muck, undrained, 0 to 1 percent slopes	1,505	0.5
JaaAK	Jamestown silt loam, 0 to 1 percent slopes, occasionally flooded, brief duration	232	*
KimA	Kimmell loam, 0 to 2 percent slopes	1,078	0.4
MfrAN	Madaus muck, drained, 0 to 1 percent slopes	94	*
MftA	Matherton loam, 0 to 1 percent slopes	1,274	0.4
MgcA	Maumee loamy sand, 0 to 1 percent slopes	1,299	0.4
MmdC2	Miami loam, 5 to 10 percent slopes, eroded	390	0.1
MmdC3	Miami clay loam, 5 to 10 percent slopes, severely eroded	414	0.1
MmdD2	Miami loam, 10 to 18 percent slopes, eroded	303	0.1
MmdD3	Miami clay loam, 10 to 18 percent slopes, severely eroded	163	*
MouAN	Milford silty clay loam, 0 to 1 percent slopes	150	*
MsaA	Mishawaka sandy loam, 0 to 1 percent slopes	571	0.2
MvkA	Morocco loamy sand, 0 to 1 percent slopes	2,727	0.9
MwzAN	Muskego muck, drained, 0 to 1 percent slopes	516	0.2
MwzAU	Muskego muck, undrained, 0 to 1 percent slopes	111	*
OmgA	Osolo loamy sand, 0 to 1 percent slopes	6,261	2.1
OmgB	Osolo loamy sand, 1 to 5 percent slopes	397	0.1
PaaAN	Palms muck, drained, 0 to 1 percent slopes	385	0.1
PkdA	Pewamo clay loam, 0 to 1 percent slopes	1,701	0.6
Pmg	Pits, gravel	707	0.2

See footnote at end of table.

Table 5.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
ReyAN	Rensselaer loam, 0 to 1 percent slopes	3,857	1.3
RopA	Riddles-Oshtemo complex, 0 to 1 percent slopes	3,272	1.1
RopB	Riddles-Oshtemo complex, 1 to 5 percent slopes	19,298	6.5
RoqC2	Riddles-Metea complex, 5 to 12 percent slopes, eroded	4,951	1.7
RoqD2	Riddles-Metea complex, 12 to 18 percent slopes, eroded	747	0.3
RosE	Riddles-Tyner complex, 18 to 30 percent slopes	415	0.1
ScuA	Sebewa loam, 0 to 1 percent slopes	4,748	1.6
SdnA	Sebewa mucky loam, 0 to 1 percent slopes	30	*
SdzA	Selfridge-Crosier complex, 0 to 1 percent slopes	878	0.3
SdzaB	Selfridge-Brems complex, 1 to 4 percent slopes	621	0.2
SnlA	Southwest silt loam, 0 to 1 percent slopes	1,762	0.6
TxuA	Tyner loamy sand, 0 to 1 percent slopes	15,049	5.0
TxuB	Tyner loamy sand, 1 to 5 percent slopes	3,336	1.1
TxuC	Tyner loamy sand, 5 to 10 percent slopes	944	0.3
TxuD	Tyner loamy sand, 10 to 18 percent slopes	497	0.2
TxuF	Tyner loamy sand, 18 to 45 percent slopes	322	0.1
Uam	Udorthents, loamy	299	0.1
Uaz	Psamments	2,117	0.7
Uba	Psammaquents, 0 to 1 percent slopes	323	0.1
UdeA	Urban land-Bainter complex, 0 to 1 percent slopes	1,744	0.6
UdkA	Urban land-Brady complex, 0 to 1 percent slopes	607	0.2
UdoA	Urban land-Brems complex, 0 to 1 percent slopes	109	*
UdpA	Urban land-Bristol complex, 0 to 1 percent slopes	5,872	2.0
UdpB	Urban land-Bristol complex, 1 to 5 percent slopes	811	0.3
UdrA	Urban land-Bronson complex, 0 to 1 percent slopes	779	0.3
UeaA	Urban land-Crosier complex, 0 to 3 percent slopes	1,270	0.4
UeqA	Urban land-Gilford complex, 0 to 1 percent slopes	578	0.2
UfzA	Urban land-Mishawaka complex, 0 to 1 percent slopes	1,877	0.6
UgaA	Urban land-Morocco complex, 0 to 1 percent slopes	136	*
UglA	Urban land-Osolo complex, 0 to 1 percent slopes	1,333	0.4
UgrA	Urban land-Rensselaer complex, 0 to 1 percent slopes	253	*
UgsB	Urban land-Riddles-Oshtemo complex, 1 to 5 percent slopes	502	0.2
UgvA	Urban land-Tyner complex, 0 to 1 percent slopes	4,150	1.4
UgvB	Urban land-Tyner complex, 1 to 5 percent slopes	400	0.1
UgwA	Urban land-Vistula complex, 0 to 1 percent slopes	1,433	0.5
UhbA	Urban land-Volinia complex, 0 to 1 percent slopes	1,518	0.5
Usl	Udorthents, rubbish	377	0.1
VnxA	Vistula loamy sand, 0 to 1 percent slopes	2,484	0.8
VolA	Volinia loam, 0 to 1 percent slopes	4,686	1.6
WcnAI	Waterford loam, 0 to 2 percent slopes, frequently flooded, long duration	2,413	0.8
WoaA	Williamstown loam, 0 to 1 percent slopes	569	0.2
WobB	Williamstown-Crosier complex, 1 to 5 percent slopes	6,896	2.3
WocC2	Williamstown loam, 5 to 10 percent slopes, eroded	1,897	0.6
WodC3	Williamstown clay loam, 5 to 10 percent slopes, severely eroded	191	*
WrxAN	Wunabuna silt loam, drained, 0 to 1 percent slopes	561	0.2
M-W	Water areas less than 40 acres in size	45	*
W	Water areas more than 40 acres in size	3,679	1.2
	Total	299,635	100.5

* Less than 0.1 percent.

Table 6.--Main Cropland Limitations and Hazards

(Only those map units that are generally suited to crop production are listed. See text for a description of the limitations and hazards listed in this table)

Map symbol and soil name	Limitations and hazards
AahAK:	
Abscota	Flooding, wetness, wind erosion, low available water capacity, excessive permeability
AbhAN:	
Adrian	Wetness, ponding, wind erosion
BaaA:	
Bainter	Wind erosion, moderate available water capacity
BaaB:	
Bainter	Water erosion, wind erosion, moderate available water capacity
BbmA:	
Baugo	Wetness, moderate available water capacity
BlaA:	
Blount	Wetness, crusting, moderate available water capacity
BlaB:	
Blount	Wetness, crusting, water erosion, moderate available water capacity
BshA:	
Brady	Wetness, wind erosion, moderate available water capacity
BteA:	
Brems	Wetness, wind erosion, low available water capacity, excessive permeability
BteB:	
Brems	Wetness, water erosion, wind erosion, low available water capacity, excessive permeability
BtxA:	
Bristol	Wind erosion, low available water capacity, excessive permeability
BtxB, BtxC:	
Bristol	Water erosion, wind erosion, low available water capacity, excessive permeability
BtxD2:	
Bristol	Part of the surface layer removed by erosion, slope, water erosion, wind erosion, low available water capacity, excessive permeability
BufA:	
Bronson	Wind erosion, moderate available water capacity
BuuA:	
Brookston	Wetness, ponding
CnbA:	
Coloma	Wind erosion, low available water capacity, excessive permeability
CnbB, CnbC:	
Coloma	Water erosion, wind erosion, low available water capacity, excessive permeability
CosA:	
Cosperville	Moderate available water capacity

Table 6.--Main Cropland Limitations and Hazards--Continued

Map symbol and soil name	Limitations and hazards
CosB:	
Cosperville	Water erosion, moderate available water capacity
CvdA:	
Crosier	Wetness, crusting, low available water capacity
CvdB:	
Crosier	Wetness, crusting, water erosion, low available water capacity
DcrA:	
Del Rey	Wetness, crusting, moderate available water capacity
DdeA:	
Desker	Wind erosion, low available water capacity
DdeB:	
Desker	Water erosion, wind erosion, low available water capacity
EchAN:	
Edwards	Wetness, ponding, wind erosion
GczA, GdnA:	
Gilford	Wetness, ponding, wind erosion, moderate available water capacity
GlaB, GlaC:	
Glynwood	Wetness, crusting, water erosion, moderate available water capacity
GndA:	
Granby	Wetness, ponding, wind erosion, low available water capacity, excessive permeability
GocAK, GodAI:	
Gravelton	Flooding, wetness, ponding, wind erosion, low available water capacity
HtbAN:	
Houghton	Wetness, ponding, wind erosion
JaaAK:	
Jamestown	Flooding, wetness
KimA:	
Kimmell	Wetness, low available water capacity
MfrAN:	
Madaus	Wetness, ponding, wind erosion, low available water capacity
MftA:	
Matherton	Wetness, moderate available water capacity
MgcA:	
Maumee	Wetness, wind erosion, low available water capacity, excessive permeability
MmdC2:	
Miami	Part of the surface layer removed by erosion, water erosion, moderate available water capacity
MmdC3:	
Miami	Much of the surface layer removed by erosion, water erosion, low available water capacity

Table 6.--Main Cropland Limitations and Hazards--Continued

Map symbol and soil name	Limitations and hazards
MmdD2:	
Miami	Part of the surface layer removed by erosion, equipment limitation, slope, water erosion, moderate available water capacity
MmdD3:	
Miami	Much of the surface layer removed by erosion, slope, water erosion, low available water capacity
MouAN:	
Milford	Wetness, ponding
MsaA:	
Mishawaka	Wind erosion, low available water capacity
MvkA:	
Morocco	Wetness, wind erosion, low available water capacity, excessive permeability
MwzAN:	
Muskego	Wetness, ponding, wind erosion
OmgA:	
Osolo	Wind erosion, low available water capacity, excessive permeability
OmgB:	
Osolo	Water erosion, wind erosion, low available water capacity, excessive permeability
PaaAN:	
Palms	Wetness, ponding, wind erosion
PkdA:	
Pewamo	Wetness, ponding
ReyAN:	
Rensselaer	Wetness, ponding
RopA:	
Riddles	Wind erosion, moderate available water capacity
Oshtemo	Wind erosion, moderate available water capacity, excessive permeability
RopB:	
Riddles	Water erosion, wind erosion, moderate available water capacity
Oshtemo	Water erosion, wind erosion, moderate available water capacity, excessive permeability
RoqC2:	
Riddles	Part of the surface layer removed by erosion, water erosion, moderate available water capacity
Metea	Part of the surface layer removed by erosion, water erosion, wind erosion, moderate available water capacity, excessive permeability
RoqD2:	
Riddles	Part of the surface layer removed by erosion, slope, water erosion, moderate available water capacity
Metea	Part of the surface layer removed by erosion, slope, water erosion, wind erosion, moderate available water capacity, excessive permeability

Table 6.--Main Cropland Limitations and Hazards--Continued

Map symbol and soil name	Limitations and hazards
ScuA, SdnA:	
Sebewa	Wetness, ponding, moderate available water capacity
SdzA:	
Selfridge	Wetness, wind erosion, moderate available water capacity, excessive permeability
Crosier	Wetness, crusting, low available water capacity
SdzaB:	
Selfridge	Wetness, water erosion, wind erosion, moderate available water capacity, excessive permeability
Brems	Wetness, water erosion, wind erosion, low available water capacity, excessive permeability
SnlA:	
Southwest	Wetness, ponding, crusting
TxuA:	
Tyner	Wind erosion, low available water capacity, excessive permeability
TxuB, TxuC:	
Tyner	Water erosion, wind erosion, low available water capacity, excessive permeability
TxuD:	
Tyner	Slope, water erosion, wind erosion, low available water capacity, excessive permeability
Uam:	
Udorthents, loamy	Crusting, water erosion, moderate available water capacity
UdeA:	
Urban land.	
Bainter	Wind erosion, moderate available water capacity
UdkA:	
Urban land.	
Brady	Wetness, wind erosion, moderate available water capacity
UdoA:	
Urban land.	
Brems	Wetness, wind erosion, low available water capacity, excessive permeability
UdpA:	
Urban land.	
Bristol	Wind erosion, low available water capacity, excessive permeability
UdpB:	
Urban land.	
Bristol	Water erosion, wind erosion, low available water capacity, excessive permeability
UdrA:	
Urban land.	
Bronson	Wetness, wind erosion, moderate available water capacity

Table 6.--Main Cropland Limitations and Hazards--Continued

Map symbol and soil name	Limitations and hazards
UeaA:	
Urban land.	
Crosier	Wetness, crusting, water erosion, low available water capacity
UeqA:	
Urban land.	
Gilford	Wetness, ponding, wind erosion, moderate available water capacity
UfzA:	
Urban land.	
Mishawaka	Wind erosion, low available water capacity
UgaA:	
Urban land.	
Morocco	Wetness, wind erosion, low available water capacity, excessive permeability
UglA:	
Urban land.	
Osolo	Wind erosion, low available water capacity, excessive permeability
UgrA:	
Urban land.	
Rensselaer	Wetness, ponding, wind erosion, low available water capacity
UgsB:	
Urban land.	
Riddles	Water erosion, wind erosion, moderate available water capacity
Oshtemo	Water erosion, wind erosion, moderate available water capacity, excessive permeability
UgvA:	
Urban land.	
Tyner	Wind erosion, low available water capacity, excessive permeability
UgvB:	
Urban land.	
Tyner	Water erosion, wind erosion, low available water capacity, excessive permeability
UgwA:	
Urban land.	
Vistula	Wind erosion, low available water capacity, excessive permeability
UhbA:	
Urban land.	
Volinia	Moderate available water capacity
VnxA:	
Vistula	Wind erosion, low available water capacity, excessive permeability

Table 6.--Main Cropland Limitations and Hazards--Continued

Map symbol and soil name	Limitations and hazards
VolA:	
Volinia	Moderate available water capacity
WcnAI:	
Waterford	Flooding, wetness, low available water capacity
WoaA:	
Williamstown	Wetness, crusting, moderate available water capacity
WobB:	
Williamstown	Wetness, crusting, water erosion, moderate available water capacity
Crosier	Wetness, crusting, water erosion, low available water capacity
WocC2:	
Williamstown	Part of the surface layer removed by erosion, wetness, crusting, water erosion, moderate available water capacity
WodC3:	
Williamstown	Part of the surface layer removed by erosion, wetness, poor tilth, crusting, water erosion, moderate available water capacity
WrxAN:	
Wunabuna	Wetness, ponding

Table 7.--Main Pasture Limitations and Hazards

(Only those map units that are generally suited to pasture are listed. See text for a description of the limitations and hazards listed in this table)

Map symbol and soil name	Limitations and hazards
AahAK:	
Abscota	Flooding, wind erosion, low available water capacity
AbhAN, AbhAU:	
Adrian, drained	Wetness, ponding, wind erosion
BaaA:	
Bainter	Wind erosion, moderate available water capacity
BaaB:	
Bainter	Water erosion, wind erosion, moderate available water capacity
BbmA:	
Baugo	Wetness, moderate available water capacity
BlaA:	
Blount	Moderate available water capacity
BlaB:	
Blount	Water erosion, moderate available water capacity
BshA:	
Brady	Wind erosion, moderate available water capacity
BteA:	
Brems	Wind erosion, low available water capacity
BteB:	
Brems	Water erosion, wind erosion, low available water capacity
BtxA:	
Bristol	Wind erosion, low available water capacity
BtxB, BtxC:	
Bristol	Water erosion, wind erosion, low available water capacity
BtxD2, BtxE:	
Bristol	Equipment limitation, water erosion, wind erosion, low available water capacity
BufA:	
Bronson	Wind erosion, moderate available water capacity
BuuA:	
Brookston	Wetness
CnbA:	
Coloma	Wind erosion, low available water capacity
CnbB, CnbC:	
Coloma	Water erosion, wind erosion, low available water capacity
CosA:	
Cosperville	Moderate available water capacity

Table 7.--Main Pasture Limitations and Hazards--Continued

Map symbol and soil name	Limitations and hazards
CosB:	
Cosperville	Water erosion, moderate available water capacity
CvdA:	
Crosier	Low available water capacity
CvdB:	
Crosier	Water erosion, low available water capacity
DcrA:	
Del Rey	Moderate available water capacity
DdeA:	
Desker	Wind erosion, low available water capacity
DdeB:	
Desker	Water erosion, wind erosion, low available water capacity
EchAN:	
Edwards	Wetness, ponding, wind erosion
GczA, GdnA:	
Gilford	Wetness, ponding, wind erosion, moderate available water capacity
GlaB, GlaC:	
Glynwood	Water erosion, moderate available water capacity
GndA:	
Granby	Wetness, ponding, wind erosion, low available water capacity
GocAK, GodAI:	
Gravelton	Flooding, wetness, ponding, wind erosion, low available water capacity
HhaAP:	
Histosols	Wetness
HtbAN:	
Houghton	Wetness, ponding, wind erosion
JaaAK:	
Jamestown	Flooding
KimA:	
Kimmell	Low available water capacity
MfrAN:	
Madaus	Wetness, ponding, wind erosion, low available water capacity
MftA:	
Matherton	Moderate available water capacity
MgcA:	
Maumee	Wetness, ponding, wind erosion, low available water capacity
MmdC2, MmdC3:	
Miami	Water erosion, low available water capacity
MmdD2, MmdD3:	
Miami	Equipment limitation, water erosion, low available water capacity
MouAN:	
Milford	Wetness, ponding

Table 7.--Main Pasture Limitations and Hazards--Continued

Map symbol and soil name	Limitations and hazards
MsaA:	
Mishawaka	Wind erosion, low available water capacity
MvkA:	
Morocco	Wind erosion, low available water capacity
MwzAN:	
Muskego	Wetness, ponding, wind erosion
OmgA:	
Osolo	Wind erosion, low available water capacity
OmgB:	
Osolo	Water erosion, wind erosion, low available water capacity
PaaAN:	
Palms	Wetness, ponding, wind erosion
PkdA:	
Pewamo	Wetness, ponding
Pmg:	
Pits	Equipment limitation, very gravelly surface, water erosion, low available water capacity
ReyAN:	
Rensselaer	Wetness, ponding
RopA:	
Riddles	Wind erosion, moderate available water capacity
Oshtemo	Wind erosion, moderate available water capacity
RopB:	
Riddles	Water erosion, wind erosion, moderate available water capacity
Oshtemo	Water erosion, wind erosion, moderate available water capacity
RoqC2:	
Riddles	Water erosion, moderate available water capacity
Metea	Water erosion, wind erosion, moderate available water capacity
RoqD2:	
Riddles	Equipment limitation, water erosion, moderate available water capacity
Metea	Equipment limitation, water erosion, wind erosion, moderate available water capacity
RosE:	
Riddles	Equipment limitation, water erosion, moderate available water capacity
Tyner	Equipment limitation, water erosion, wind erosion, low available water capacity
ScuA:	
Sebewa	Wetness, ponding, moderate available water capacity
SdnA:	
Sebewa	Wetness, ponding, moderate available water capacity

Table 7.--Main Pasture Limitations and Hazards--Continued

Map symbol and soil name	Limitations and hazards
SdzA:	
Selfridge	Wind erosion, low available water capacity
Crosier	Low available water capacity
SdzaB:	
Selfridge	Water erosion, wind erosion, low available water capacity
Brems	Water erosion, wind erosion, low available water capacity
TxuB, TxuC:	
Tyner	Water erosion, wind erosion, low available water capacity
TxuD, TxuF:	
Tyner	Equipment limitation, water erosion, wind erosion, low available water capacity
Uam:	
Udorthents, loamy	Water erosion, moderate available water capacity
Uaz:	
Psamments	Water erosion, wind erosion, very low available water capacity
Uba:	
Psammaquents	Water erosion, wind erosion, very low available water capacity
UdeA:	
Urban land.	
Bainter	Wind erosion, moderate available water capacity
UdkA:	
Urban land.	
Brady	Wind erosion, moderate available water capacity
UdoA:	
Urban land.	
Brems	Wind erosion, low available water capacity
UdpA:	
Urban land.	
Bristol	Wind erosion, low available water capacity
UdpB:	
Urban land.	
Bristol	Water erosion, wind erosion, low available water capacity
UdrA:	
Urban land.	
Bronson	Wind erosion, moderate available water capacity

Table 7.--Main Pasture Limitations and Hazards--Continued

Map symbol and soil name	Limitations and hazards
UeaA:	
Urban land.	
Crosier	Water erosion, low available water capacity
UeqA:	
Urban land.	
Gilford	Wetness, ponding, wind erosion, moderate available water capacity
UfzA:	
Urban land.	
Mishawaka	Wind erosion, low available water capacity
UgaA:	
Urban land.	
Morocco	Wind erosion, low available water capacity
UglA:	
Urban land.	
Osolo	Wind erosion, low available water capacity
UgrA:	
Urban land.	
Rensselaer	Wetness, ponding, wind erosion, low available water capacity
UgsB:	
Urban land.	
Riddles	Water erosion, wind erosion, moderate available water capacity
Oshtemo	Water erosion, wind erosion, moderate available water capacity
UgvA:	
Urban land.	
Tyner	Wind erosion, low available water capacity
UgvB:	
Urban land.	
Tyner	Water erosion, wind erosion, low available water capacity
UgwA:	
Urban land.	
Vistula	Wind erosion, low available water capacity
UhbA:	
Urban land.	
Volinia	Moderate available water capacity
VnxA:	
Vistula	Wind erosion, low available water capacity
VolA:	
Volinia	Moderate available water capacity

Table 7.--Main Pasture Limitations and Hazards--Continued

Map symbol and soil name	Limitations and hazards
WcnAI:	
Waterford	Flooding, low available water capacity
WoaA:	
Williamstown	Moderate available water capacity
WobB:	
Williamstown	Water erosion, moderate available water capacity
Crosier	Wetness, water erosion, low available water capacity
WocC2, WodC3:	
Williamstown	Water erosion, moderate available water capacity
WrxAN:	
Wunabuna	Wetness, ponding

Table 8.--Land Capability and Yields per Acre of Crops and Pasture

(Yields are those that can be expected under a high level of management. They are for nonirrigated areas. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Map symbol and soil name	Land capability	Corn	Soybeans	Winter wheat	Grass-legume hay	Pasture
		Bu	Bu	Bu	Tons	AUM*
AahAK:						
Abscota-------------	4s	75	26	26	2.5	5.0
AbhAN:						
Adrian, drained-----	3w	120	42	48	4.0	8.0
AbhAU:						
Adrian, undrained---	5w	---	---	---	---	---
BaaA:						
Bainter-------------	3s	75	26	30	2.5	5.0
BaaB:						
Bainter-------------	3e	75	26	30	2.5	5.0
BbmA:						
Baugo---------------	2w	130	46	52	4.3	8.6
BlaA:						
Blount--------------	2w	105	37	47	3.5	7.0
BlaB:						
Blount--------------	2e	105	37	47	3.5	7.0
BshA:						
Brady---------------	2w	100	35	40	3.3	6.6
BteA:						
Brems---------------	4s	60	21	27	2.0	4.0
BteB:						
Brems---------------	4s	60	21	27	2.0	4.0
BtxA:						
Bristol-------------	3s	50	18	23	1.7	3.4
BtxB:						
Bristol-------------	3s	50	18	23	1.7	3.4
BtxC:						
Bristol-------------	3e	40	14	18	1.3	2.6
BtxD2:						
Bristol-------------	4e	40	14	18	1.3	2.6
BtxE:						
Bristol-------------	6e	---	---	---	0.5	1.0
BufA:						
Bronson-------------	2s	90	32	36	3.0	6.0
BuuA:						
Brookston-----------	2w	145	51	65	4.8	9.6

See footnote at end of table.

Table 8.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Corn	Soybeans	Winter wheat	Grass-legume hay	Pasture
		Bu	Bu	Bu	Tons	AUM*
CnbA:						
Coloma--------------	4s	50	18	23	1.7	3.4
CnbB:						
Coloma--------------	4s	45	16	20	1.5	3.0
CnbC:						
Coloma--------------	6s	40	14	18	1.3	2.6
CosA:						
Cosperville---------	2s	95	33	43	3.1	6.2
CosB:						
Cosperville---------	2e	95	33	43	3.1	6.2
CvdA:						
Crosier-------------	2w	120	42	54	4.0	8.0
CvdB:						
Crosier-------------	2e	120	42	54	4.0	8.0
DcrA:						
Del Rey-------------	2w	105	37	47	3.5	7.0
DdeA:						
Desker--------------	3s	75	26	38	2.5	5.0
DdeB:						
Desker--------------	3s	75	26	38	2.5	5.0
EchAN:						
Edwards, drained----	4w	110	39	44	3.6	7.2
EchAU:						
Edwards, undrained--	5w	---	---	---	---	---
GczA:						
Gilford-------------	2w	120	42	48	4.0	8.0
GdnA:						
Gilford-------------	2w	120	42	48	4.0	8.0
GlaB:						
Glynwood------------	3e	95	33	43	3.1	6.2
GlaC:						
Glynwood------------	3e	85	30	38	2.8	5.6
GndA:						
Granby--------------	4w	105	37	47	3.5	7.0
GocAK:						
Gravelton-----------	3w	110	39	50	3.6	7.2
GodAI:						
Gravelton-----------	3w	---	---	---	---	---
HhaAP:						
Histosols-----------	8w	---	---	---	---	---

See footnote at end of table.

Table 8.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Corn	Soybeans	Winter wheat	Grass-legume hay	Pasture
		Bu	Bu	Bu	Tons	AUM*
HtbAN:						
Houghton, drained---	3w	130	46	52	4.3	8.6
HtbAU:						
Houghton, undrained	5w	---	---	---	---	---
JaaAK:						
Jamestown-----------	2w	120	42	54	4.0	8.0
KimA:						
Kimmell-------------	2w	105	37	47	3.5	7.0
MfrAN:						
Madaus, drained-----	4w	90	32	36	3.0	6.0
MftA:						
Matherton-----------	2w	100	35	50	3.3	6.6
MgcA:						
Maumee--------------	3w	110	39	50	3.6	7.2
MmdC2:						
Miami---------------	3e	95	33	43	3.1	6.2
MmdC3:						
Miami---------------	4e	90	32	41	3.0	6.0
MmdD2:						
Miami---------------	4e	80	28	36	2.6	5.2
MmdD3:						
Miami---------------	6e	75	26	34	2.5	5.0
MouAN:						
Milford-------------	2w	135	47	61	4.5	9.0
MsaA:						
Mishawaka-----------	3s	70	25	32	2.3	4.6
MvkA:						
Morocco-------------	3s	70	25	32	2.3	4.6
MwzAN:						
Muskego, drained----	4w	110	39	44	3.6	7.2
MwzAU:						
Muskego, undrained--	6w	---	---	---	---	---
OmgA:						
Osolo---------------	3s	75	26	34	2.5	5.0
OmgB:						
Osolo---------------	3s	75	26	34	2.5	5.0
PaaAN:						
Palms, drained------	3w	130	46	52	4.3	8.6
PkdA:						
Pewamo--------------	2w	130	46	59	4.3	8.6

See footnote at end of table.

Table 8.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Corn	Soybeans	Winter wheat	Grass-legume hay	Pasture
		Bu	Bu	Bu	Tons	AUM*
Pmg:						
Pits.						
ReyAN:						
Rensselaer----------	2w	150	53	60	5.0	10.0
RopA:						
Riddles-------------	1	105	37	47	3.5	7.0
Oshtemo-------------	3s	70	25	28	2.3	4.6
RopB:						
Riddles-------------	2e	105	37	47	3.5	7.0
Oshtemo-------------	3e	70	25	28	2.3	4.6
RoqC2:						
Riddles-------------	3e	90	32	41	3.0	6.0
Metea---------------	3e	70	25	32	2.3	4.6
RoqD2:						
Riddles-------------	4e	75	26	34	2.5	5.0
Metea---------------	4e	55	19	25	1.8	3.6
RosE:						
Riddles-------------	6e	---	---	---	0.8	1.6
Tyner---------------	6e	---	---	---	0.2	0.4
ScuA:						
Sebewa--------------	2w	120	42	60	4.0	8.0
SdnA:						
Sebewa--------------	2w	120	42	60	4.0	8.0
SdzA:						
Selfridge-----------	3w	90	32	41	3.0	6.0
Crosier-------------	2w	120	42	54	4.0	8.0
SdzaB:						
Selfridge-----------	3e	90	32	41	3.0	6.0
Brems---------------	4s	60	21	27	2.0	4.0
SnlA:						
Southwest-----------	2w	135	47	54	4.5	9.0
TxuA:						
Tyner---------------	3s	50	18	23	1.7	3.3
TxuB:						
Tyner---------------	3s	50	18	23	1.7	3.3
TxuC:						
Tyner---------------	3e	40	14	18	1.3	2.6

See footnote at end of table.

Table 8.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Corn	Soybeans	Winter wheat	Grass-legume hay	Pasture
		Bu	Bu	Bu	Tons	AUM*
TxuD:						
Tyner	4e	15	5	7	0.5	1.0
TxuF:						
Tyner	6e	---	---	---	0.2	0.4
Uam:						
Udorthents, loamy	8s	---	---	---	---	---
Uaz:						
Psamments	8s	---	---	---	---	---
Uba:						
Psammaquents	8s	---	---	---	---	---
UdeA:						
Urban land.						
Bainter	3s	75	26	30	2.5	5.0
UdkA:						
Urban land.						
Brady	2w	100	35	40	3.3	6.6
UdoA:						
Urban land.						
Brems	4s	60	21	27	2.0	4.0
UdpA:						
Urban land.						
Bristol	3s	50	18	23	1.7	3.4
UdpB:						
Urban land.						
Bristol	3s	50	18	23	1.7	3.4
UdrA:						
Urban land.						
Bronson	2s	90	32	36	3.0	6.0
UeaA:						
Urban land.						
Crosier	2w	120	42	54	4.0	8.0
UeqA:						
Urban land.						
Gilford	2w	120	42	48	4.0	8.0
UfzA:						
Urban land.						
Mishawaka	3s	70	25	32	2.3	4.6

See footnote at end of table.

Table 8.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Corn	Soybeans	Winter wheat	Grass-legume hay	Pasture
		Bu	Bu	Bu	Tons	AUM*
UgaA:						
Urban land.						
Morocco	3s	70	25	32	2.3	4.6
UglA:						
Urban land.						
Osolo	3s	75	26	34	2.5	5.0
UgrA:						
Urban land.						
Rensselaer	2w	150	53	60	5.0	10.0
UgsB:						
Urban land.						
Riddles	2e	105	37	47	3.5	7.0
Oshtemo	3e	70	25	28	2.3	4.6
UgvA:						
Urban land.						
Tyner	3s	50	18	23	1.7	3.3
UgvB:						
Urban land.						
Tyner	3s	50	18	23	1.7	3.3
UgwA:						
Urban land.						
Vistula	3s	50	18	23	1.7	3.3
UhbA:						
Urban land.						
Volinia	2s	100	35	50	3.3	6.6
Usl:						
Udorthents, rubbish.						
VnxA:						
Vistula	3s	50	18	23	1.7	3.3
VolA:						
Volinia	2s	100	35	50	3.3	6.6
WcnAI:						
Waterford	5w	65	23	23	2.2	4.4
WoaA:						
Williamstown	1	110	38	50	3.6	7.2

See footnote at end of table.

Table 8.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Corn	Soybeans	Winter wheat	Grass-legume hay	Pasture
		Bu	Bu	Bu	Tons	AUM*
WobB:						
Williamstown--------	2e	110	38	50	3.6	7.2
Crosier-------------	2e	120	42	54	4.0	8.0
WocC2:						
Williamstown--------	3e	100	35	45	3.3	6.6
WodC3:						
Williamstown--------	3e	90	32	41	3.0	6.0
WrxAN:						
Wunabuna, drained---	2w	135	47	54	4.5	9.0

* Animal unit month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

Table 9.--Prime Farmland

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
BaaA	Bainter sandy loam, 0 to 1 percent slopes
BaaB	Bainter sandy loam, 1 to 4 percent slopes
BbmA	Baugo silt loam, 0 to 1 percent slopes (where drained)
BlaA	Blount loam, 0 to 1 percent slopes (where drained)
BlaB	Blount loam, 1 to 4 percent slopes (where drained)
BshA	Brady sandy loam, 0 to 1 percent slopes (where drained)
BufA	Bronson sandy loam, 0 to 1 percent slopes
BuuA	Brookston loam, 0 to 1 percent slopes (where drained)
CosA	Cosperville loam, 0 to 2 percent slopes
CosB	Cosperville loam, 2 to 5 percent slopes
CvdA	Crosier loam, 0 to 1 percent slopes (where drained)
CvdB	Crosier loam, 1 to 4 percent slopes (where drained)
DcrA	Del Rey silty clay loam, 0 to 1 percent slopes
DdeA	Desker sandy loam, 0 to 1 percent slopes
DdeB	Desker sandy loam, 1 to 6 percent slopes
GczA	Gilford sandy loam, 0 to 1 percent slopes (where drained)
GdnA	Gilford mucky sandy loam, 0 to 1 percent slopes (where drained)
GlaB	Glynwood loam, 1 to 5 percent slopes
JaaAK	Jamestown silt loam, 0 to 1 percent slopes, occasionally flooded, brief duration (where drained and either protected from flooding or not frequently flooded during the growing season)
KimA	Kimmell loam, 0 to 2 percent slopes (where drained)
MftA	Matherton loam, 0 to 1 percent slopes (where drained)
MouAN	Milford silty clay loam, 0 to 1 percent slopes (where drained)
MsaA	Mishawaka sandy loam, 0 to 1 percent slopes
PkdA	Pewamo clay loam, 0 to 1 percent slopes (where drained)
ReyAN	Rensselaer loam, 0 to 1 percent slopes (where drained)
ScuA	Sebewa loam, 0 to 1 percent slopes (where drained)
SdnA	Sebewa mucky loam, 0 to 1 percent slopes (where drained)
SdzA	Selfridge-Crosier complex, 0 to 1 percent slopes
SnlA	Southwest silt loam, 0 to 1 percent slopes (where drained)
VolA	Volinia loam, 0 to 1 percent slopes
WoaA	Williamstown loam, 0 to 1 percent slopes (where drained)
WobB	Williamstown-Crosier complex, 1 to 5 percent slopes
WrxAN	Wunabuna silt loam, drained, 0 to 1 percent slopes (where drained)

Table 10.--Windbreaks and Environmental Plantings

(Only those map units that are generally suitable for windbreaks and environmental plantings are listed. Absence of an entry indicates that trees generally do not grow to the given height)

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
AahAK: Abscota	American cranberrybush, black chokeberry, common elderberry, common winterberry, northern spicebush, redosier dogwood, silky dogwood.	Hazel alder, roughleaf dogwood.	Washington hawthorn, northern white-cedar.	Blackgum, bur oak, common hackberry, green ash, red maple, river birch.	Eastern cottonwood, imperial Carolina poplar.
AbhAN: Adrian	American elder, black chokeberry, buttonbush, common winterberry, gray dogwood, highbush blueberry, highbush cranberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Alternateleaf dogwood, hazel alder, nannyberry, roughleaf dogwood.	Common persimmon, northern white-cedar, tamarack.	Pin oak, river birch, swamp white oak, sweetgum.	Eastern cottonwood, green ash, imperial Carolina poplar, red maple, silver maple.
BaaA, BaaB: Bainter	American cranberrybush, common elderberry, northern spicebush, redosier dogwood, silky dogwood.	Hazel alder, roughleaf dogwood.	Washington hawthorn, northern white-cedar.	Norway spruce, blackgum, bur oak, common hackberry, green ash, pin oak, red maple, river birch, swamp white oak, sweetgum.	Eastern cottonwood, imperial Carolina poplar.
BbmA: Baugo	American cranberrybush, Canada yew, black chokeberry, common elderberry, common juniper, common winterberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Blackhaw, cock's-spur hawthorn, common pawpaw, hazel alder, nannyberry, roughleaf dogwood, southern arrowwood, witchhazel.	Washington hawthorn, common hackberry, eastern redcedar, northern white-cedar, shingle oak, tamarack.	Norway spruce, blackgum, green ash, pin oak, red maple, swamp chestnut oak, swamp white oak, sweetgum.	Eastern cottonwood, imperial Carolina poplar.

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
BlaA, BlaB: Blount	American cranberrybush, Canada yew, black chokeberry, common elderberry, common winterberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Blackhaw, cock's-spur hawthorn, common pawpaw, hazel alder, nannyberry, roughleaf dogwood, southern arrowwood, witchhazel.	Washington hawthorn, eastern redcedar, northern white-cedar, shingle oak, tamarack.	Norway spruce, green ash, pin oak, red maple, swamp chestnut oak, swamp white oak.	Eastern cottonwood, imperial Carolina poplar.
BshA: Brady	American cranberrybush, Canada yew, black chokeberry, common elderberry, common juniper, common winterberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Blackhaw, cock's-spur hawthorn, common pawpaw, hazel alder, nannyberry, roughleaf dogwood, southern arrowwood, witchhazel.	Washington hawthorn, common hackberry, eastern redcedar, northern white-cedar, shingle oak, tamarack.	Norway spruce, blackgum, green ash, pin oak, red maple, swamp chestnut oak, swamp white oak, sweetgum.	Eastern cottonwood, imperial Carolina poplar.
BteA, BteB: Brems	American cranberrybush, common elderberry, silky dogwood.	Blackhaw, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac.	American plum, Washington hawthorn, eastern redcedar, serviceberry.	Virginia pine, blackgum, bur oak, common hackberry, green ash, red maple, river birch.	Eastern cottonwood, imperial Carolina poplar.
BtxA, BtxB, BtxC, BtxD2, BtxE: Bristol	American cranberrybush, common elderberry, silky dogwood.	Blackhaw, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac.	American plum, Washington hawthorn, eastern redcedar, serviceberry.	Virginia pine, blackgum, bur oak, common hackberry, green ash, red maple, river birch.	Eastern cottonwood, imperial Carolina poplar.
BufA: Bronson	American cranberrybush, common elderberry, northern spicebush, redosier dogwood, silky dogwood.	Hazel alder, roughleaf dogwood.	Washington hawthorn, northern white-cedar.	Norway spruce, blackgum, bur oak, common hackberry, green ash, pin oak, red maple, river birch, swamp white oak, sweetgum.	Eastern cottonwood, imperial Carolina poplar.

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
BuuA:					
Brookston	American elder, black chokeberry, buttonbush, common winterberry, gray dogwood, highbush blueberry, highbush cranberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Cock's-spur hawthorn, hazel alder, nannyberry, roughleaf dogwood.	Common hackberry, green hawthorn, northern white-cedar, shingle oak, tamarack.	Norway spruce, blackgum, river birch, swamp white oak, sweetgum.	Eastern cottonwood, green ash, imperial Carolina poplar, pin oak, red maple.
CnbA, CnbB, CnbC:					
Coloma	American cranberrybush, common elderberry, silky dogwood.	Blackhaw, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac.	American plum, Washington hawthorn, eastern redcedar, serviceberry.	Virginia pine, blackgum, bur oak, common hackberry, green ash, red maple, river birch.	Eastern cottonwood, imperial Carolina poplar.
CosA, CosB:					
Cosperville	American cranberrybush, black chokeberry, common elderberry, common juniper, common winterberry, coralberry, gray dogwood, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Blackhaw, hazelnut, nannyberry, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac, sweet crabapple, witchhazel.	American plum, Washington hawthorn, common hackberry, eastern redcedar, northern white-cedar, red pine, serviceberry.	Norway spruce, black cherry, black walnut, blackgum, green ash, northern red oak, pin oak, tuliptree, white oak.	Eastern cottonwood, eastern white pine, imperial Carolina poplar.
CvdA, CvdB:					
Crosier	American cranberrybush, Canada yew, black chokeberry, common elderberry, common winterberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Blackhaw, cock's-spur hawthorn, common pawpaw, hazel alder, nannyberry, roughleaf dogwood, southern arrowwood, witchhazel.	Washington hawthorn, eastern redcedar, northern white-cedar, shingle oak, tamarack.	Norway spruce, green ash, pin oak, red maple, swamp chestnut oak, swamp white oak.	Eastern cottonwood, imperial Carolina poplar.

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
DcrA: Del Rey	American cranberrybush, Canada yew, black chokeberry, common elderberry, common juniper, common winterberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Blackhaw, cock's-spur hawthorn, common pawpaw, hazel alder, nannyberry, roughleaf dogwood, southern arrowwood, witchhazel.	Washington hawthorn, common hackberry, eastern redcedar, northern white-cedar, shingle oak, tamarack.	Norway spruce, blackgum, green ash, pin oak, red maple, swamp chestnut oak, swamp white oak, sweetgum.	Eastern cottonwood, imperial Carolina poplar.
DdeA, DdeB: Desker	American cranberrybush, black chokeberry, common elderberry, common juniper, silky dogwood.	Hazelnut, roughleaf dogwood, smooth sumac, staghorn sumac.	Washington hawthorn, northern white-cedar.	Virginia pine, blackgum, bur oak, common hackberry, green ash, red maple, river birch.	Eastern cottonwood, imperial Carolina poplar.
EchAN: Edwards	American elder, black chokeberry, buttonbush, common winterberry, gray dogwood, highbush blueberry, highbush cranberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Alternateleaf dogwood, hazel alder, nannyberry, roughleaf dogwood.	Common persimmon, northern white-cedar, tamarack.	Pin oak, river birch, swamp white oak, sweetgum.	Eastern cottonwood, green ash, imperial Carolina poplar, red maple, silver maple.
GczA, GdnA: Gilford	American cranberrybush, black chokeberry, buttonbush, common elderberry, common winterberry, gray dogwood, highbush blueberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Cock's-spur hawthorn, hazel alder, nannyberry, roughleaf dogwood.	Common hackberry, northern white-cedar, shingle oak, tamarack.	Norway spruce, blackgum, green ash, pin oak, river birch, swamp white oak, sweetgum.	Eastern cottonwood, imperial Carolina poplar.

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
GlaB, GlaC:					
Glynwood	American cranberrybush, common juniper, coralberry, gray dogwood, silky dogwood.	Blackhaw, hazelnut, nannyberry, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac.	American plum, Washington hawthorn, eastern redcedar, northern white-cedar, serviceberry.	Norway spruce, Virginia pine, black oak, blackgum, common hackberry, green ash.	Eastern cottonwood, eastern white pine, imperial Carolina poplar.
GndA:					
Granby	American cranberrybush, black chokeberry, buttonbush, common elderberry, common winterberry, gray dogwood, highbush blueberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Cock's-spur hawthorn, hazel alder, nannyberry, roughleaf dogwood.	Common hackberry, northern white-cedar, shingle oak, tamarack.	Norway spruce, blackgum, green ash, pin oak, river birch, swamp white oak, sweetgum.	Eastern cottonwood, imperial Carolina poplar.
GocAK, GodAI:					
Gravelton	American cranberrybush, black chokeberry, common elderberry, common winterberry, gray dogwood, highbush blueberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Cock's-spur hawthorn, hazel alder, roughleaf dogwood.	Common hackberry, northern white-cedar, shingle oak, tamarack.	Blackgum, green ash, pin oak, red maple, river birch, swamp white oak, sweetgum.	Eastern cottonwood, imperial Carolina poplar.
HtbAN:					
Houghton	American elder, black chokeberry, buttonbush, common winterberry, gray dogwood, highbush blueberry, highbush cranberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Alternateleaf dogwood, hazel alder, nannyberry, roughleaf dogwood.	Common persimmon, northern white-cedar, tamarack.	Pin oak, river birch, swamp white oak, sweetgum.	Eastern cottonwood, green ash, imperial Carolina poplar, red maple, silver maple.

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
JaaAK:					
Jamestown	American cranberrybush, Canada yew, black chokeberry, common elderberry, common juniper, common winterberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Blackhaw, cock's-spur hawthorn, common pawpaw, hazel alder, nannyberry, roughleaf dogwood, southern arrowwood, witchhazel.	Washington hawthorn, common hackberry, eastern redcedar, northern white-cedar, shingle oak, tamarack.	Norway spruce, blackgum, green ash, pin oak, red maple, swamp chestnut oak, swamp white oak, sweetgum.	Eastern cottonwood, imperial Carolina poplar.
KimA:					
Kimmell	American cranberrybush, Canada yew, black chokeberry, common elderberry, common juniper, common winterberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Blackhaw, cock's-spur hawthorn, common pawpaw, hazel alder, nannyberry, roughleaf dogwood, southern arrowwood, witchhazel.	Washington hawthorn, common hackberry, eastern redcedar, northern white-cedar, shingle oak, tamarack.	Norway spruce, blackgum, green ash, pin oak, red maple, swamp chestnut oak, swamp white oak, sweetgum.	Eastern cottonwood, imperial Carolina poplar.
MfrAN:					
Madaus	American elder, black chokeberry, buttonbush, common winterberry, gray dogwood, highbush blueberry, highbush cranberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Alternateleaf dogwood, hazel alder, nannyberry, roughleaf dogwood.	Common persimmon, northern white-cedar, tamarack.	Pin oak, river birch, swamp white oak, sweetgum.	Eastern cottonwood, green ash, imperial Carolina poplar, red maple, silver maple.
MftA:					
Matherton	American cranberrybush, Canada yew, black chokeberry, common elderberry, common juniper, common winterberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Blackhaw, cock's-spur hawthorn, common pawpaw, hazel alder, nannyberry, roughleaf dogwood, southern arrowwood, witchhazel.	Washington hawthorn, common hackberry, eastern redcedar, northern white-cedar, shingle oak, tamarack.	Norway spruce, blackgum, green ash, pin oak, red maple, swamp chestnut oak, swamp white oak, sweetgum.	Eastern cottonwood, imperial Carolina poplar.

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
MgcA: Maumee	American cranberrybush, black chokeberry, buttonbush, common elderberry, common winterberry, gray dogwood, highbush blueberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Cock's-spur hawthorn, hazel alder, nannyberry, roughleaf dogwood.	Common hackberry, northern white-cedar, shingle oak, tamarack.	Norway spruce, blackgum, green ash, pin oak, river birch, swamp white oak, sweetgum.	Eastern cottonwood, imperial Carolina poplar.
MmdC2: Miami	Common juniper, coralberry, gray dogwood, highbush cranberry, silky dogwood.	Blackhaw, flame sumac, hazelnut, nannyberry, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac.	American plum, Washington hawthorn, common hackberry, common serviceberry, eastern redcedar, northern white-cedar, chinkapin oak.	Norway spruce, black oak, blackgum, green ash.	Eastern cottonwood, imperial Carolina poplar.
MmdC3: Miami	American cranberrybush, common juniper, coralberry, gray dogwood, silky dogwood.	Blackhaw, hazelnut, nannyberry, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac.	American plum, Washington hawthorn, chinkapin oak, common serviceberry, eastern redcedar, northern white-cedar.	Norway spruce, Virginia pine, black oak, blackgum, chinkapin oak, common hackberry, green ash.	Eastern cottonwood, imperial Carolina poplar.
MmdD2: Miami	Common juniper, coralberry, gray dogwood, highbush cranberry, silky dogwood.	Blackhaw, flame sumac, hazelnut, nannyberry, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac.	American plum, Washington hawthorn, common hackberry, common serviceberry, eastern redcedar, northern white-cedar, chinkapin oak.	Norway spruce, black oak, blackgum, green ash.	Eastern cottonwood, imperial Carolina poplar.
MmdD3: Miami	American cranberrybush, common juniper, coralberry, gray dogwood, silky dogwood.	Blackhaw, hazelnut, nannyberry, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac.	American plum, Washington hawthorn, chinkapin oak, common serviceberry, eastern redcedar, northern white-cedar.	Norway spruce, Virginia pine, black oak, blackgum, chinkapin oak, common hackberry, green ash.	Eastern cottonwood, imperial Carolina poplar.

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
MouAN:					
Milford-----------	American elder, black chokeberry, buttonbush, common winterberry, gray dogwood, highbush blueberry, highbush cranberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Cock's-spur hawthorn, hazel alder, nannyberry, roughleaf dogwood.	Common hackberry, green hawthorn, northern white-cedar, shingle oak, tamarack.	Norway spruce, blackgum, river birch, swamp white oak, sweetgum.	Eastern cottonwood, green ash, imperial Carolina poplar, pin oak, red maple.
MsaA:					
Mishawaka---------	American elder, highbush cranberry, silky dogwood.	Blackhaw, flame sumac, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac.	American plum, Washington hawthorn, common hackberry, eastern redcedar, serviceberry.	Blackgum, bur oak, green ash, red maple, river birch.	Eastern cottonwood, eastern white pine, imperial Carolina poplar.
MvkA:					
Morocco-----------	American cranberrybush, common elderberry, silky dogwood.	Blackhaw, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac.	American plum, Washington hawthorn, eastern redcedar, serviceberry.	Virginia pine, blackgum, bur oak, common hackberry, green ash, red maple, river birch.	Eastern cottonwood, imperial Carolina poplar.
MwzAN:					
Muskego-----------	American elder, black chokeberry, buttonbush, common winterberry, gray dogwood, highbush blueberry, highbush cranberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Alternateleaf dogwood, hazel alder, nannyberry, roughleaf dogwood.	Common persimmon, northern white-cedar, tamarack.	Pin oak, river birch, swamp white oak, sweetgum.	Eastern cottonwood, green ash, imperial Carolina poplar, red maple, silver maple.
OmgA, OmgB:					
Osolo-------------	American cranberrybush, common elderberry, silky dogwood.	Blackhaw, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac.	American plum, Washington hawthorn, common hackberry, eastern redcedar, serviceberry.	Virginia pine, blackgum, bur oak, common hackberry, green ash, red maple, river birch.	Eastern cottonwood, imperial Carolina poplar.

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
PaaAN:					
Palms	American cranberrybush, black chokeberry, buttonbush, common elderberry, common winterberry, gray dogwood, highbush blueberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Hazel alder, roughleaf dogwood.	Northern white-cedar, tamarack.	Green ash, pin oak, river birch, silver maple, swamp white oak, sweetgum.	Eastern cottonwood.
PkdA:					
Pewamo	American cranberrybush, black chokeberry, buttonbush, common elderberry, common winterberry, gray dogwood, highbush blueberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Cock's-spur hawthorn, hazel alder, nannyberry, roughleaf dogwood.	Common hackberry, northern white-cedar, shingle oak, tamarack.	Norway spruce, blackgum, green ash, pin oak, river birch, swamp white oak, sweetgum.	Eastern cottonwood, imperial Carolina poplar.
ReyAN:					
Rensselaer	American elder, black chokeberry, buttonbush, common winterberry, gray dogwood, highbush blueberry, highbush cranberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Cock's-spur hawthorn, hazel alder, nannyberry, roughleaf dogwood.	Common hackberry, green hawthorn, northern white-cedar, shingle oak, tamarack.	Norway spruce, blackgum, river birch, swamp white oak, sweetgum.	Eastern cottonwood, green ash, imperial Carolina poplar, pin oak, red maple.

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
RopA, RopB:					
Riddles	American cranberrybush, black chokeberry, common elderberry, common juniper, common winterberry, coralberry, gray dogwood, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Blackhaw, hazelnut, nannyberry, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac, sweet crabapple, witchhazel.	American plum, Washington hawthorn, common hackberry, eastern redcedar, northern white-cedar, red pine, serviceberry.	Norway spruce, black cherry, black walnut, blackgum, green ash, northern red oak, pin oak, tuliptree, white oak.	Eastern cottonwood, eastern white pine, imperial Carolina poplar.
Oshtemo	American cranberrybush, common elderberry, northern spicebush, redosier dogwood, silky dogwood.	Hazel alder, roughleaf dogwood.	Washington hawthorn, northern white-cedar.	Norway spruce, blackgum, bur oak, common hackberry, green ash, pin oak, red maple, river birch, swamp white oak, sweetgum.	Eastern cottonwood, imperial Carolina poplar.
RoqC2, RoqD2:					
Riddles	American cranberrybush, black chokeberry, common elderberry, common juniper, common winterberry, coralberry, gray dogwood, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Blackhaw, hazelnut, nannyberry, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac, sweet crabapple, witchhazel.	American plum, Washington hawthorn, common hackberry, eastern redcedar, northern white-cedar, red pine, serviceberry.	Norway spruce, black cherry, black walnut, blackgum, green ash, northern red oak, pin oak, tuliptree, white oak.	Eastern cottonwood, eastern white pine, imperial Carolina poplar.
Metea	American cranberrybush, common elderberry, northern spicebush, redosier dogwood, silky dogwood.	Hazel alder, roughleaf dogwood.	Washington hawthorn, northern white-cedar.	Norway spruce, blackgum, bur oak, common hackberry, green ash, pin oak, red maple, river birch, swamp white oak, sweetgum.	Eastern cottonwood, imperial Carolina poplar.

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
RosE:					
Riddles	American cranberrybush, black chokeberry, common elderberry, common juniper, common winterberry, coralberry, gray dogwood, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Blackhaw, hazelnut, nannyberry, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac, sweet crabapple, witchhazel.	American plum, Washington hawthorn, common hackberry, eastern redcedar, northern white-cedar, red pine, serviceberry.	Norway spruce, black cherry, black walnut, blackgum, green ash, northern red oak, pin oak, tuliptree, white oak.	Eastern cottonwood, eastern white pine, imperial Carolina poplar.
Tyner	American cranberrybush, common elderberry, silky dogwood.	Blackhaw, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac.	American plum, Washington hawthorn, common hackberry, eastern redcedar, serviceberry.	Virginia pine, blackgum, bur oak, common hackberry, green ash, red maple, river birch.	Eastern cottonwood, imperial Carolina poplar.
ScuA:					
Sebewa	American elder, black chokeberry, buttonbush, common winterberry, gray dogwood, highbush blueberry, highbush cranberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Cock's-spur hawthorn, hazel alder, nannyberry, roughleaf dogwood.	Common hackberry, green hawthorn, northern white-cedar, shingle oak, tamarack.	Norway spruce, blackgum, river birch, swamp white oak, sweetgum.	Eastern cottonwood, green ash, imperial Carolina poplar, pin oak, red maple.
SdnA:					
Sebewa	American cranberrybush, black chokeberry, buttonbush, common elderberry, common winterberry, gray dogwood, highbush blueberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Cock's-spur hawthorn, hazel alder, nannyberry, roughleaf dogwood.	Common hackberry, northern white-cedar, shingle oak, tamarack.	Norway spruce, blackgum, green ash, pin oak, river birch, swamp white oak, sweetgum.	Eastern cottonwood, imperial Carolina poplar.

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
SdzA:					
Selfridge	American cranberrybush, common elderberry, northern spicebush, redosier dogwood, silky dogwood.	Hazel alder, roughleaf dogwood.	Washington hawthorn, northern white-cedar.	Norway spruce, blackgum, bur oak, common hackberry, green ash, pin oak, red maple, river birch, swamp white oak, sweetgum.	Eastern cottonwood, imperial Carolina poplar.
Crosier	American cranberrybush, Canada yew, black chokeberry, common elderberry, common winterberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Blackhaw, cock's-spur hawthorn, common pawpaw, hazel alder, nannyberry, roughleaf dogwood, southern arrowwood, witchhazel.	Washington hawthorn, eastern redcedar, northern white-cedar, shingle oak, tamarack.	Norway spruce, baldcypress, green ash, pin oak, red maple, swamp chestnut oak, swamp white oak.	Eastern cottonwood, imperial Carolina poplar.
SdzaB:					
Selfridge	American cranberrybush, common elderberry, northern spicebush, redosier dogwood, silky dogwood.	Hazel alder, roughleaf dogwood.	Washington hawthorn, northern white-cedar.	Norway spruce, blackgum, bur oak, common hackberry, green ash, pin oak, red maple, river birch, swamp white oak, sweetgum.	Eastern cottonwood, imperial Carolina poplar.
Brems	American cranberrybush, common elderberry, silky dogwood.	Blackhaw, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac.	American plum, Washington hawthorn, common hackberry, eastern redcedar, serviceberry.	Virginia pine, blackgum, bur oak, common hackberry, green ash, red maple, river birch.	Eastern cottonwood, imperial Carolina poplar.
SnlA:					
Southwest	American elder, black chokeberry, buttonbush, common winterberry, gray dogwood, highbush blueberry, highbush cranberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Cock's-spur hawthorn, hazel alder, nannyberry, roughleaf dogwood.	Common hackberry, green hawthorn, northern white-cedar, shingle oak, tamarack.	Norway spruce, blackgum, river birch, swamp white oak, sweetgum.	Eastern cottonwood, green ash, imperial Carolina poplar, pin oak, red maple.

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
TxuA, TxuB, TxuC, TxuD, TxuF:					
Tyner	American cranberrybush, common elderberry, silky dogwood.	Blackhaw, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac.	American plum, Washington hawthorn, common hackberry, eastern redcedar, serviceberry.	Virginia pine, blackgum, bur oak, common hackberry, green ash, red maple, river birch.	Eastern cottonwood, imperial Carolina poplar.
UdeA:					
Urban land.					
Bainter	American cranberrybush, common elderberry, northern spicebush, redosier dogwood, silky dogwood.	Hazel alder, roughleaf dogwood.	Washington hawthorn, northern white-cedar.	Norway spruce, blackgum, bur oak, common hackberry, green ash, pin oak, red maple, river birch, swamp white oak, sweetgum.	Eastern cottonwood, imperial Carolina poplar.
UdkA:					
Urban land.					
Brady	American cranberrybush, Canada yew, black chokeberry, common elderberry, common juniper, common winterberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Blackhaw, cock's-spur hawthorn, common pawpaw, hazel alder, nannyberry, roughleaf dogwood, southern arrowwood, witchhazel.	Washington hawthorn, common hackberry, eastern redcedar, northern white-cedar, shingle oak, tamarack.	Norway spruce, blackgum, green ash, pin oak, red maple, swamp chestnut oak, swamp white oak, sweetgum.	Eastern cottonwood, imperial Carolina poplar.
UdoA:					
Urban land.					
Brems	American cranberrybush, common elderberry, silky dogwood.	Blackhaw, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac.	American plum, Washington hawthorn, common hackberry, eastern redcedar, serviceberry.	Virginia pine, blackgum, bur oak, common hackberry, green ash, red maple, river birch.	Eastern cottonwood, imperial Carolina poplar.
UdpA, UdpB:					
Urban land.					
Bristol	American cranberrybush, common elderberry, silky dogwood.	Blackhaw, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac.	American plum, Washington hawthorn, common hackberry, eastern redcedar, serviceberry.	Virginia pine, blackgum, bur oak, common hackberry, green ash, red maple, river birch.	Eastern cottonwood, imperial Carolina poplar.

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
UdrA:					
Urban land.					
Bronson	American cranberrybush, common elderberry, northern spicebush, redosier dogwood, silky dogwood.	Hazel alder, roughleaf dogwood.	Washington hawthorn, northern white-cedar.	Norway spruce, baldcypress, blackgum, bur oak, common hackberry, green ash, pin oak, red maple, river birch, swamp white oak, sweetgum.	Eastern cottonwood, imperial Carolina poplar.
UeaA:					
Urban land.					
Crosier	American cranberrybush, Canada yew, black chokeberry, common elderberry, common winterberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Blackhaw, cock's-spur hawthorn, common pawpaw, hazel alder, nannyberry, roughleaf dogwood, southern arrowwood, witchhazel.	Washington hawthorn, eastern redcedar, northern white-cedar, shingle oak, tamarack.	Norway spruce, green ash, pin oak, red maple, swamp chestnut oak, swamp white oak.	Eastern cottonwood, imperial Carolina poplar.
UeqA:					
Urban land.					
Gilford	American cranberrybush, black chokeberry, buttonbush, common elderberry, common winterberry, gray dogwood, highbush blueberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Cock's-spur hawthorn, hazel alder, nannyberry, roughleaf dogwood.	Common hackberry, northern white-cedar, shingle oak, tamarack.	Norway spruce, blackgum, green ash, pin oak, river birch, swamp white oak, sweetgum.	Eastern cottonwood, imperial Carolina poplar.
UfzA:					
Urban land.					
Mishawaka	American elder, highbush cranberry, silky dogwood.	Blackhaw, flame sumac, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac.	American plum, Washington hawthorn, common hackberry, eastern redcedar, serviceberry.	Blackgum, bur oak, green ash, red maple, river birch.	Eastern cottonwood, eastern white pine, imperial Carolina poplar.

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
UgaA:					
Urban land.					
Morocco	American cranberrybush, common elderberry, silky dogwood.	Blackhaw, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac.	American plum, Washington hawthorn, common hackberry, eastern redcedar, serviceberry.	Virginia pine, blackgum, bur oak, common hackberry, green ash, red maple, river birch.	Eastern cottonwood, imperial Carolina poplar.
UglA:					
Urban land.					
Osolo	American cranberrybush, common elderberry, silky dogwood.	Blackhaw, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac.	American plum, Washington hawthorn, common hackberry, eastern redcedar, serviceberry.	Virginia pine, blackgum, bur oak, common hackberry, green ash, red maple, river birch.	Eastern cottonwood, imperial Carolina poplar.
UgrA:					
Urban land.					
Rensselaer	American elder, black chokeberry, buttonbush, common winterberry, gray dogwood, highbush blueberry, highbush cranberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Cock's-spur hawthorn, hazel alder, nannyberry, roughleaf dogwood.	Common hackberry, green hawthorn, northern white-cedar, shingle oak, tamarack.	Norway spruce, blackgum, river birch, swamp white oak, sweetgum.	Eastern cottonwood, green ash, imperial Carolina poplar, pin oak, red maple.
UgsB:					
Urban land.					
Riddles	American cranberrybush, black chokeberry, common elderberry, common juniper, common winterberry, coralberry, gray dogwood, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Blackhaw, hazelnut, nannyberry, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac, sweet crabapple, witchhazel.	American plum, Washington hawthorn, common hackberry, eastern redcedar, northern white-cedar, red pine, serviceberry.	Norway spruce, black cherry, black walnut, blackgum, green ash, northern red oak, pin oak, tuliptree, white oak.	Eastern cottonwood, eastern white pine, imperial Carolina poplar.

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
UgsB:					
Oshtemo	American cranberrybush, common elderberry, northern spicebush, redosier dogwood, silky dogwood.	Hazel alder, roughleaf dogwood.	Washington hawthorn, northern white-cedar.	Norway spruce, blackgum, bur oak, common hackberry, green ash, pin oak, red maple, river birch, swamp white oak, sweetgum.	Eastern cottonwood, imperial Carolina poplar.
UgvA, UgvB:					
Urban land.					
Tyner	American cranberrybush, common elderberry, silky dogwood.	Blackhaw, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac.	American plum, Washington hawthorn, common hackberry, eastern redcedar, serviceberry.	Virginia pine, blackgum, bur oak, common hackberry, green ash, red maple, river birch.	Eastern cottonwood, imperial Carolina poplar.
UgwA:					
Urban land.					
Vistula	American cranberrybush, common elderberry, silky dogwood.	Blackhaw, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac.	American plum, Washington hawthorn, common hackberry, eastern redcedar, serviceberry.	Virginia pine, blackgum, bur oak, common hackberry, green ash, red maple, river birch.	Eastern cottonwood, imperial Carolina poplar.
UhbA:					
Urban land.					
Volinia	American cranberrybush, black chokeberry, common elderberry, common juniper, common winterberry, coralberry, gray dogwood, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Blackhaw, hazelnut, nannyberry, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac, sweet crabapple, witchhazel.	American plum, Washington hawthorn, common hackberry, eastern redcedar, northern white-cedar, red pine, serviceberry.	Norway spruce, black cherry, black walnut, blackgum, green ash, northern red oak, pin oak, tuliptree, white oak.	Eastern cottonwood, eastern white pine, imperial Carolina poplar.
VnxA:					
Vistula	American cranberrybush, common elderberry, silky dogwood.	Blackhaw, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac.	American plum, Washington hawthorn, common hackberry, eastern redcedar, serviceberry.	Virginia pine, blackgum, bur oak, common hackberry, green ash, red maple, river birch.	Eastern cottonwood, imperial Carolina poplar.

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
VolA: Volinia	American cranberrybush, black chokeberry, common elderberry, common juniper, common winterberry, coralberry, gray dogwood, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Blackhaw, hazelnut, nannyberry, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac, sweet crabapple, witchhazel.	American plum, Washington hawthorn, common hackberry, eastern redcedar, northern white-cedar, red pine, serviceberry.	Norway spruce, black cherry, black walnut, blackgum, green ash, northern red oak, pin oak, tuliptree, white oak.	Eastern cottonwood, eastern white pine, imperial Carolina poplar.
WcnAI: Waterford	American cranberrybush, black chokeberry, common elderberry, common winterberry, highbush blueberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Cock's-spur hawthorn, common pawpaw, hazel alder, nannyberry, roughleaf dogwood.	Washington hawthorn, common hackberry, northern white-cedar, shingle oak, tamarack.	Norway spruce, blackgum, green ash, pin oak, red maple, swamp chestnut oak, swamp white oak, sweetgum.	Eastern cottonwood, imperial Carolina poplar.
WoaA: Williamstown	American cranberrybush, common juniper, coralberry, gray dogwood, silky dogwood.	Blackhaw, hazelnut, nannyberry, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac.	American plum, Washington hawthorn, eastern redcedar, northern white-cedar, serviceberry.	Norway spruce, Virginia pine, black oak, blackgum, common hackberry, green ash.	Eastern cottonwood, eastern white pine, imperial Carolina poplar.
WobB: Williamstown	American cranberrybush, common juniper, coralberry, gray dogwood, silky dogwood.	Blackhaw, hazelnut, nannyberry, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac.	American plum, Washington hawthorn, eastern redcedar, northern white-cedar, serviceberry.	Norway spruce, Virginia pine, black oak, blackgum, common hackberry, green ash.	Eastern cottonwood, eastern white pine, imperial Carolina poplar.

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
WobB:					
Crosier	American cranberrybush, Canada yew, black chokeberry, common elderberry, common winterberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Blackhaw, cock's-spur hawthorn, common pawpaw, hazel alder, nannyberry, roughleaf dogwood, southern arrowwood, witchhazel.	Washington hawthorn, eastern redcedar, northern white-cedar, shingle oak, tamarack.	Norway spruce, baldcypress, green ash, pin oak, red maple, swamp chestnut oak, swamp white oak.	Eastern cottonwood, imperial Carolina poplar.
WocC2:					
Williamstown	Common juniper, coralberry, gray dogwood, highbush cranberry, silky dogwood.	Blackhaw, flame sumac, hazelnut, nannyberry, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac.	American plum, Washington hawthorn, common hackberry, common serviceberry, eastern redcedar, northern white-cedar, chinkapin oak.	Norway spruce, black oak, blackgum, green ash.	Eastern cottonwood, imperial Carolina poplar.
WodC3:					
Williamstown	Common juniper, coralberry, gray dogwood, highbush cranberry, silky dogwood.	Blackhaw, flame sumac, hazelnut, nannyberry, prairie crabapple, roughleaf dogwood, smooth sumac, southern arrowwood, staghorn sumac.	American plum, Washington hawthorn, common hackberry, common serviceberry, eastern redcedar, northern white-cedar, chinkapin oak.	Norway spruce, black oak, blackgum, green ash.	Eastern cottonwood, imperial Carolina poplar.
WrxAN:					
Wunabuna	American elder, black chokeberry, buttonbush, common winterberry, gray dogwood, highbush blueberry, highbush cranberry, ninebark, northern spicebush, redosier dogwood, silky dogwood.	Cock's-spur hawthorn, hazel alder, nannyberry, roughleaf dogwood.	Common hackberry, green hawthorn, northern white-cedar, shingle oak, tamarack.	Norway spruce, blackgum, river birch, swamp white oak, sweetgum.	Eastern cottonwood, green ash, imperial Carolina poplar, pin oak, red maple.

Table 11.--Forestland Management and Productivity

(Only the soils suitable for production of commercial trees are listed)

Map symbol and soil name	Ordi-nation symbol	Management concerns: Erosion hazard	Equip-ment limita-tion	Seedling mortal-ity	Wind-throw hazard	Plant competi-tion	Potential productivity: Common trees	Site index	Volume of wood fiber*	Suggested trees to plant
AahAK:										
Abscota	6S	Slight	Moderate	Moderate	Slight	Moderate	Northern red oak	80	86	Black cherry, black oak, bur oak, chinkapin oak, eastern white pine, red pine, scarlet oak, shingle oak, white oak.
							White ash	80	86	
							Silver maple	---	---	
							American sycamore	---	---	
							Eastern cottonwood	---	---	
AbhAN, AbhAU:										
Adrian	2W	Slight	Severe	Severe	Severe	Severe	Green ash	69	57	American sycamore, bur oak, green ash, pin oak, red maple, river birch, silver maple, swamp white oak.
							Red maple	53	29	
							Silver maple	78	29	
							White ash	69	57	
							Tamarack	45	29	
							Quaking aspen	60	57	
BaaA:										
Bainter	4A	Slight	Slight	Slight	Slight	Slight	Northern red oak	72	57	Shumard's oak, black cherry, black walnut, bur oak, chinkapin oak, eastern white pine, green ash, northern red oak, red pine, tuliptree, white ash, white oak.
							Black oak	83	57	
BaaB:										
Bainter	4A	Slight	Slight	Slight	Slight	Slight	Black oak	83	57	Shumard's oak, black cherry, black walnut, bur oak, chinkapin oak, eastern white pine, green ash, northern red oak, red pine, tuliptree, white ash, white oak.
							Northern red oak	72	57	

See footnote at end of table.

Table 11.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume of wood fiber*	Suggested trees to plant
BbmA:										
Baugo	8W	Slight	Moderate	Moderate	Moderate	Severe	Pin oak	97	86	American sycamore, Shumard's oak, bur oak, green ash, northern red oak, pin oak, red maple, river birch, shingle oak, silver maple, swamp white oak, white ash, white oak.
							Tuliptree	82	72	
							White ash	89	114	
BlaA, BlaB:										
Blount	3C	Slight	Slight	Severe	Severe	Slight	Northern red oak	65	43	American sycamore, Shumard's oak, bur oak, green ash, northern red oak, pin oak, red maple, river birch, shingle oak, silver maple, swamp white oak, white ash, white oak.
							White oak	65	43	
							Green ash	---	---	
							Bur oak	---	---	
							Pin oak	---	---	
BshA:										
Brady	5A	Slight	Slight	Slight	Slight	Severe	Black oak	90	72	American sycamore, Shumard's oak, bur oak, green ash, northern red oak, pin oak, red maple, river birch, shingle oak, silver maple, swamp white oak, white ash, white oak.
							Red maple	---	---	
							Green ash	---	---	
							Quaking aspen	---	---	
							Bur oak	---	---	
							Slippery elm	---	---	
BteA, BteB:										
Brems	4A	Slight	Slight	Slight	Slight	Slight	Northern red oak	70	57	Black cherry, black oak, bur oak, chinkapin oak, eastern white pine, red pine, scarlet oak, shingle oak, white oak.
							Eastern white pine	65	143	
							Black oak	72	57	

See footnote at end of table.

Table 11.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume of wood fiber*	Suggested trees to plant
BtxA, BtxB, BtxC, BtxD2:										
Bristol	4S	Slight	Slight	Severe	Slight	Moderate	Black oak	68	57	Black cherry, black oak, bur oak, chinkapin oak, eastern white pine, red pine, scarlet oak, white oak.
							Tuliptree	87	86	
BtxE:										
Bristol	4S	Moderate	Moderate	Severe	Slight	Moderate	Black oak	68	57	Black cherry, black oak, bur oak, chinkapin oak, eastern white pine, red pine, scarlet oak, white oak.
							Tuliptree	87	86	
BufA:										
Bronson	5A	Slight	Slight	Slight	Slight	Moderate	Northern red oak	70	72	Shumard's oak, black cherry, black walnut, bur oak, chinkapin oak, eastern white pine, green ash, northern red oak, red pine, tuliptree, white ash, white oak.
							Red pine	72	129	
							Eastern white pine	85	200	
BuuA:										
Brookston	5W	Slight	Severe	Severe	Severe	Severe	White oak	75	57	American sycamore, bur oak, green ash, pin oak, red maple, river birch, shingle oak, silver maple, swamp white oak.
							Northern red oak	78	57	
							Sweetgum	90	100	
							Pin oak	86	72	
CnbA, CnbB, CnbC:										
Coloma	4S	Slight	Moderate	Moderate	Slight	Slight	White oak	70	57	Black cherry, black oak, bur oak, chinkapin oak, eastern white pine, red pine, scarlet oak, shingle oak, white oak.
							Northern red oak	70	57	

See footnote at end of table.

Table 11.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume of wood fiber*	Suggested trees to plant
CosA:										
Cosperville	8A	Slight	Slight	Slight	Slight	Severe	Tuliptree	105	114	Shumard's oak, black cherry, black walnut, bur oak, chinkapin oak, eastern white pine, green ash, northern red oak, red pine, tuliptree, white ash, white oak.
							Black oak	89	72	
CosB:										
Cosperville	8A	Slight	Slight	Slight	Slight	Severe	Black oak	89	72	Shumard's oak, black cherry, black walnut, bur oak, chinkapin oak, eastern white pine, green ash, northern red oak, red pine, tuliptree, white ash, white oak.
							Tuliptree	105	114	
CvdA, CvdB:										
Crosier	8A	Slight	Slight	Slight	Slight	Moderate	Northern red oak	72	57	American sycamore, Shumard's oak, bur oak, green ash, northern red oak, pin oak, red maple, river birch, silver maple, swamp white oak, white ash, white oak.
							Tuliptree	102	114	
DcrA:										
Del Rey	4C	Slight	Slight	Severe	Severe	Slight	Northern red oak	70	57	American sycamore, Shumard's oak, bur oak, green ash, northern red oak, pin oak, red maple, river birch, silver maple, swamp white oak, white ash, white oak.
							Green ash	---	---	
							White oak	70	57	
							Bur oak	---	---	

See footnote at end of table.

Table 11.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume of wood fiber*	Suggested trees to plant
DdeA, DdeB:										
Desker	4S	Slight	Slight	Severe	Slight	Moderate	Tuliptree	87	86	Black cherry, black oak, bur oak, chinkapin oak, eastern white pine, red pine, scarlet oak, shingle oak, white oak.
							Black oak	68	57	
EchAN, EchAU:										
Edwards	2W	Slight	Severe	Severe	Severe	Severe	Silver maple	76	29	American sycamore, bur oak, green ash, pin oak, red maple, river birch, silver maple, swamp white oak.
							Red maple	51	29	
							White ash	51	29	
							Quaking aspen	56	57	
							Black willow	---	---	
GczA, GdnA:										
Gilford	4W	Slight	Severe	Severe	Severe	Severe	Pin oak	70	57	American sycamore, bur oak, green ash, pin oak, red maple, river birch, silver maple, swamp white oak.
							Red maple	60	43	
							Eastern white pine	55	100	
							Bigtooth aspen	70	86	
GlaB, GlaC:										
Glynwood	4C	Slight	Slight	Severe	Severe	Moderate	White oak	80	57	Shumard's oak, black cherry, black walnut, bur oak, chinkapin oak, eastern white pine, green ash, northern red oak, red pine, tuliptree, white ash, white oak.
							White ash	---	---	
							Black cherry	---	---	
							Red maple	---	---	
							Slippery elm	---	---	
							Northern red oak	80	57	
							Black oak	80	57	
GndA:										
Granby	4W	Slight	Severe	Severe	Severe	Severe	Pin oak	70	57	American sycamore, bur oak, green ash, pin oak, red maple, river birch, shingle oak, silver maple, swamp white oak.
							Eastern white pine	75	172	
							Quaking aspen	70	86	

See footnote at end of table.

Table 11.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume of wood fiber*	Suggested trees to plant
GocAK, GodAI:										
Gravelton------	3W	Slight	Severe	Severe	Severe	Severe	Eastern cottonwood--	100	129	American sycamore, bur oak, green ash, pin oak, red maple, river birch, shingle oak, silver maple, swamp white oak.
							Silver maple--------	95	43	
							White ash-----------	72	72	
							Red maple-----------	72	43	
							American sycamore---	90	100	
							American elm--------	70	---	
							Pin oak-------------	90	72	
HtbAN:										
Houghton-------	2W	Slight	Severe	Severe	Severe	Severe	Silver maple--------	82	29	American sycamore, bur oak, green ash, pin oak, red maple, river birch, silver maple, swamp white oak.
							White ash-----------	56	43	
							Red maple-----------	56	29	
							Green ash-----------	---	---	
							Eastern arborvitae--	37	57	
							Tamarack------------	52	43	
							Quaking aspen-------	60	57	
HtbAU:										
Houghton-------	2W	Slight	Severe	Severe	Severe	Severe	Silver maple--------	76	29	American sycamore, bur oak, green ash, pin oak, red maple, river birch, silver maple, swamp white oak.
							Red maple-----------	51	29	
							White ash-----------	51	29	
							Black willow--------	---	0	
							Quaking aspen-------	56	57	
JaaAK:										
Jamestown------	5W	Slight	Moderate	Moderate	Moderate	Severe	Pin oak-------------	90	72	American sycamore, Shumard's oak, bur oak, green ash, northern red oak, pin oak, red maple, river birch, shingle oak, silver maple, swamp white oak, white ash, white oak.
							Sweetgum------------	86	100	
							White ash-----------	---	---	
							Tuliptree-----------	90	86	
							Eastern cottonwood--	---	---	

See footnote at end of table.

Table 11.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume of wood fiber*	Suggested trees to plant
KimA:										
Kimmell	7W	Slight	Moderate	Moderate	Moderate	Severe	Tuliptree	94	100	American sycamore, Shumard's oak, bur oak, green ash, northern red oak, pin oak, red maple, river birch, shingle oak, silver maple, swamp white oak, white ash, white oak.
							Northern red oak	---	---	
							Black oak	80	57	
MfrAN:										
Madaus	2W	Slight	Severe	Severe	Severe	Severe	Red maple	55	29	American sycamore, bur oak, green ash, pin oak, red maple, river birch, silver maple, swamp white oak.
MftA:										
Matherton	4W	Slight	Moderate	Slight	Slight	Moderate	Northern red oak	62	57	American sycamore, Shumard's oak, bur oak, green ash, northern red oak, pin oak, river birch, silver maple, swamp white oak, white ash, white oak, red maple.
							Red maple	---	---	
							White ash	---	---	
							White oak	---	---	
							Swamp white oak	---	---	
							American basswood	---	---	
MgcA:										
Maumee	4W	Slight	Severe	Slight	Severe	Slight	Pin oak	70	57	American sycamore, bur oak, green ash, pin oak, red maple, river birch, shingle oak, silver maple, swamp white oak.
							Eastern white pine	69	143	
							Bigtooth aspen	71	86	

See footnote at end of table.

Table 11.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume of wood fiber*	Suggested trees to plant
MmdC2, MmdC3, MmdD2, MmdD3:										
Miami	5A	Slight	Slight	Slight	Slight	Moderate	White oak	90	72	Shumard's oak, black cherry, black walnut, bur oak, chinkapin oak, eastern white pine, green ash, northern red oak, red pine, tuliptree, white ash, white oak.
							Sweetgum	76	72	
							Tuliptree	98	100	
MouAN:										
Milford	5W	Slight	Severe	Severe	Severe	Severe	Northern red oak	76	57	American sycamore, bur oak, green ash, silver maple, ash, pin oak, red maple, river birch, shingle oak, swamp white oak.
							Pin oak	70	57	
							Eastern white pine	69	143	
							Bigtooth aspen	71	86	
MsaA:										
Mishawaka	4S	Slight	Slight	Severe	Slight	Slight	Black oak	82	57	Black cherry, black oak, bur oak, chinkapin oak, eastern white pine, red pine, scarlet oak, shingle oak, white oak.
MvkA:										
Morocco	4S	Slight	Moderate	Moderate	Slight	Severe	Black oak	84	72	Bur oak, green ash, red maple, silver maple, white ash, white oak.
							Eastern white pine	69	143	
							Bigtooth aspen	85	100	
							Pin oak	74	57	
MwzAN, MwzAU:										
Muskego	2W	Slight	Severe	Severe	Severe	Severe	Red maple	51	29	American sycamore, bur oak, green ash, pin oak, red maple, river birch, silver maple, swamp white oak.
							Silver maple	---	---	
							White ash	52	29	
							Green ash	---	---	
							Quaking aspen	56	57	
							Black willow	---	---	

See footnote at end of table.

Table 11.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume of wood fiber*	Suggested trees to plant
OmgA, OmgB:										
Osolo----------	4S	Slight	Slight	Moderate	Slight	Slight	Black oak-----------	70	57	Black cherry, black oak, bur oak, chinkapin oak, eastern white pine, red pine, scarlet oak, shingle oak, white oak.
							Red pine------------	70	129	
							Tuliptree-----------	85	86	
							Eastern white pine--	65	143	
							Northern red oak----	70	57	
PaaAN:										
Palms----------	2W	Slight	Severe	Severe	Severe	Severe	Silver maple--------	76	29	American sycamore, bur oak, green ash, pin oak, red maple, river birch, silver maple, swamp white oak.
							Red maple-----------	51	29	
							White ash-----------	51	29	
							Quaking aspen-------	56	57	
							Black willow--------	---	---	
PkdA:										
Pewamo---------	5W	Slight	Severe	Severe	Severe	Severe	Pin oak-------------	90	72	American sycamore, bur oak, green ash, pin oak, red maple, river birch, shingle oak, silver maple, swamp white oak.
							White ash-----------	71	72	
							Red maple-----------	71	43	
							Green ash-----------	---	---	
							Eastern cottonwood--	98	129	
							Swamp white oak-----	---	---	
ReyAN:										
Rensselaer-----	5W	Slight	Severe	Severe	Severe	Severe	Pin oak-------------	86	72	American sycamore, bur oak, green ash, pin oak, red maple, river birch, shingle oak, silver maple, swamp white oak.
							Sweetgum------------	90	100	
							White oak-----------	75	57	
							Northern red oak----	76	57	
RopA, RopB:										
Riddles--------	5A	Slight	Slight	Slight	Slight	Moderate	White oak-----------	90	72	Shumard's oak, black cherry, black walnut, bur oak, chinkapin oak, eastern white pine, green ash, northern red oak, red pine, tuliptree, white ash, white oak.
							Sweetgum------------	76	72	
							Tuliptree-----------	98	100	
							Northern red oak----	90	72	

See footnote at end of table.

Table 11.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume of wood fiber*	Suggested trees to plant
RopA, RopB:										
Oshtemo	4A	Slight	Slight	Slight	Slight	Moderate	White oak	70	57	Shumard's oak, black cherry, black walnut, bur oak, chinkapin oak, eastern white pine, green ash, northern red oak, red pine, tuliptree, white ash, white oak.
							Red pine	78	143	
							Eastern white pine	85	200	
RoqC2:										
Riddles	5A	Slight	Slight	Slight	Slight	Moderate	White oak	90	72	Shumard's oak, black cherry, black walnut, bur oak, chinkapin oak, eastern white pine, green ash, northern red oak, red pine, tuliptree, white ash, white oak.
							Tuliptree	98	100	
							Sweetgum	76	72	
							Northern red oak	90	72	
Metea	4A	Slight	Slight	Slight	Slight	Slight	White oak	80	57	Shumard's oak, black cherry, black walnut, bur oak, chinkapin oak, eastern white pine, green ash, northern red oak, red pine, tuliptree, white ash, white oak.
							Tuliptree	86	86	
							Red pine	75	143	
							Eastern white pine	75	172	
RoqD2:										
Riddles	5R	Moderate	Moderate	Slight	Slight	Moderate	White oak	90	72	Shumard's oak, black cherry, black walnut, bur oak, chinkapin oak, eastern white pine, green ash, northern red oak, red pine, tuliptree, white ash, white oak.
							Northern red oak	90	72	
							Sweetgum	76	72	
							Tuliptree	98	100	

See footnote at end of table.

Table 11.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordi- nation symbol	Management concerns: Erosion hazard	Equip- ment limita- tion	Seedling mortal- ity	Wind- throw hazard	Plant competi- tion	Potential productivity: Common trees	Site index	Volume of wood fiber*	Suggested trees to plant
RoqD2:										
Metea----------	4R	Moderate	Moderate	Slight	Slight	Slight	White oak-----------	80	57	Shumard's oak, black cherry, black walnut, bur oak, chinkapin oak, eastern white pine, green ash, northern red oak, red pine, tuliptree, white ash, white oak.
							Tuliptree-----------	86	86	
							Red pine------------	75	143	
							Eastern white pine--	75	172	
RosE:										
Riddles--------	5R	Moderate	Moderate	Slight	Slight	Moderate	White oak-----------	90	72	Shumard's oak, black cherry, black walnut, bur oak, chinkapin oak, eastern white pine, green ash, northern red oak, red pine, tuliptree, white ash, white oak.
							Northern red oak----	90	72	
							Sweetgum------------	76	72	
							Tuliptree-----------	98	100	
Tyner----------	4S	Moderate	Moderate	Severe	Slight	Moderate	Tuliptree-----------	88	86	Black cherry, black oak, bur oak, chinkapin oak, eastern white pine, red pine, scarlet oak, white oak.
							Black oak-----------	74	57	
ScuA, SdnA:										
Sebewa---------	5W	Slight	Severe	Severe	Severe	Severe	Pin oak-------------	88	72	American sycamore, bur oak, green ash, pin oak, red maple, river birch, shingle oak, silver maple, swamp white oak.
							White ash-----------	75	72	
							Red maple-----------	---	---	
							White oak-----------	72	72	
							American basswood---	---	---	

See footnote at end of table.

Table 11.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume of wood fiber*	Suggested trees to plant
SdzA:										
Selfridge------	6S	Slight	Slight	Slight	Slight	Severe	Quaking aspen-------	70	86	American sycamore, Shumard's oak, bur oak, green ash, northern red oak, pin oak, red maple, river birch, shingle oak, silver maple, swamp white oak, white ash, white oak.
							Red maple-----------	---	---	
							Eastern cottonwood--	90	100	
							Black oak-----------	---	---	
Crosier--------	8A	Slight	Slight	Slight	Slight	Moderate	Northern red oak----	72	57	American sycamore, Shumard's oak, bur oak, green ash, northern red oak, pin oak, red maple, river birch, shingle oak, silver maple, swamp white oak, white ash, white oak.
							Tuliptree-----------	102	114	
SdzaB:										
Selfridge------	6S	Slight	Slight	Slight	Slight	Severe	Quaking aspen-------	70	86	American sycamore, Shumard's oak, bur oak, green ash, northern red oak, pin oak, red maple, river birch, shingle oak, silver maple, swamp white oak, white ash, white oak.
							Red maple-----------	---	---	
							Eastern cottonwood--	90	100	
							Black oak-----------	---	---	
Brems----------	4A	Slight	Slight	Slight	Slight	Slight	Northern red oak----	70	57	Black cherry, black oak, bur oak, chinkapin oak, eastern white pine, red pine, scarlet oak, shingle oak, white oak.
							Eastern white pine--	65	143	
							Black oak-----------	72	57	

See footnote at end of table.

Table 11.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume of wood fiber*	Suggested trees to plant
SnlA:										
Southwest	5W	Slight	Severe	Severe	Moderate	Severe	Pin oak	86	72	American sycamore, bur oak, green ash, pin oak, red maple, river birch, shingle oak, silver maple, swamp white oak.
							Silver maple	---	---	
							Green ash	---	---	
							Red maple	70	43	
							Sweetgum	90	100	
							American basswood	---	---	
							White oak	---	---	
							Northern red oak	75	57	
TxuA, TxuB, TxuC, TxuD:										
Tyner	4S	Slight	Slight	Severe	Slight	Moderate	Tuliptree	88	86	Black cherry, black oak, bur oak, chinkapin oak, eastern white pine, red pine, scarlet oak, shingle oak, white oak.
							Black oak	74	57	
TxuF:										
Tyner	4S	Moderate	Moderate	Severe	Slight	Moderate	Tuliptree	88	86	Black cherry, black oak, bur oak, chinkapin oak, eastern white pine, red pine, scarlet oak, shingle oak, white oak.
							Black oak	74	57	
UdeA:										
Urban land.										
Bainter	4A	Slight	Slight	Slight	Slight	Slight	Northern red oak	72	57	Shumard's oak, black cherry, black walnut, bur oak, chinkapin oak, eastern white pine, green ash, northern red oak, red pine, tuliptree, white ash, white oak.
							Black oak	83	57	

See footnote at end of table.

Table 11.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume of wood fiber*	Suggested trees to plant
UdkA:										
Urban land.										
Brady	5A	Slight	Slight	Slight	Slight	Severe	Black oak	90	72	American sycamore, Shumard's oak, bur oak, green ash, northern red oak, pin oak, red maple, river birch, shingle oak, silver maple, swamp white oak, white ash, white oak.
							Green ash	---	---	
							Red maple	---	---	
							Quaking aspen	---	---	
							Slippery elm	---	---	
							Bur oak	---	---	
UdoA:										
Urban land.										
Brems	4A	Slight	Slight	Slight	Slight	Slight	Northern red oak	70	57	Black cherry, black oak, bur oak, chinkapin oak, eastern white pine, red pine, scarlet oak, shingle oak, white oak.
							Eastern white pine	65	143	
							Black oak	72	57	
UdpA, UdpB:										
Urban land.										
Bristol	4S	Slight	Slight	Severe	Slight	Moderate	Tuliptree	87	86	Black cherry, black oak, bur oak, chinkapin oak, eastern white pine, red pine, scarlet oak, white oak.
							Black oak	68	57	
UdrA:										
Urban land.										
Bronson	5A	Slight	Slight	Slight	Slight	Moderate	Northern red oak	70	72	Shumard's oak, black cherry, black walnut, bur oak, chinkapin oak, eastern white pine, green ash, northern red oak, red pine, tuliptree, white ash, white oak.
							Red pine	72	129	
							Eastern white pine	85	200	

See footnote at end of table.

Table 11.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume of wood fiber*	Suggested trees to plant
UeaA:										
Urban land.										
Crosier	8A	Slight	Slight	Slight	Slight	Moderate	Northern red oak	72	57	American sycamore, Shumard's oak, bur oak, green ash, northern red oak, pin oak, red maple, river birch, shingle oak, silver maple, swamp white oak, white ash, white oak.
							Tuliptree	102	114	
UeqA:										
Urban land.										
Gilford	4W	Slight	Severe	Severe	Severe	Severe	Red maple	60	43	American sycamore, bur oak, green ash, pin oak, red maple, river birch, shingle oak, silver maple, swamp white oak.
							Eastern white pine	55	100	
							Bigtooth aspen	70	86	
							Pin oak	70	57	
UfzA:										
Urban land.										
Mishawaka	4S	Slight	Slight	Severe	Slight	Slight	Black oak	82	57	Black cherry, black oak, bur oak, chinkapin oak, eastern white pine, red pine, scarlet oak, shingle oak, white oak.
UgaA:										
Urban land.										
Morocco	4S	Slight	Moderate	Moderate	Slight	Severe	Black oak	84	72	Bur oak, green ash, red maple, silver maple, white ash, white oak.
							Eastern white pine	69	143	
							Bigtooth aspen	85	100	
							Pin oak	74	57	

See footnote at end of table.

Table 11.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume of wood fiber*	Suggested trees to plant
UglA:										
Urban land.										
Osolo----------	4S	Slight	Slight	Moderate	Slight	Slight	Black oak-----------	70	57	Black cherry, black oak, bur oak, chinkapin oak, eastern white pine, red pine, scarlet oak, white oak.
							Red pine------------	70	129	
							Tuliptree-----------	85	86	
							Eastern white pine--	65	143	
							Northern red oak----	70	57	
UgrA:										
Urban land.										
Rensselaer-----	5W	Slight	Severe	Severe	Severe	Severe	Pin oak-------------	85	72	American sycamore, bur oak, green ash, pin oak, red maple, river birch, shingle oak, silver maple, swamp white oak.
							White ash-----------	80	86	
UgsB:										
Urban land.										
Riddles--------	5A	Slight	Slight	Slight	Slight	Moderate	White oak-----------	90	72	Shumard's oak, black cherry, black walnut, bur oak, chinkapin oak, eastern white pine, green ash, northern red oak, red pine, tuliptree, white ash, white oak.
							Sweetgum------------	76	72	
							Tuliptree-----------	98	100	
							Northern red oak----	90	72	
Oshtemo--------	4A	Slight	Slight	Slight	Slight	Moderate	Eastern white pine--	85	200	Shumard's oak, black cherry, black walnut, bur oak, chinkapin oak, eastern white pine, green ash, northern red oak, red pine, tuliptree, white ash, white oak.
							Jack pine-----------	68	100	
							Red pine------------	78	143	
							White oak-----------	70	57	

See footnote at end of table.

Table 11.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume of wood fiber*	Suggested trees to plant
UgvA, UgvB:										
Urban land.										
Tyner	4S	Slight	Slight	Severe	Slight	Moderate	Tuliptree Black oak	88 74	86 57	Black cherry, black oak, bur oak, chinkapin oak, eastern white pine, red pine, scarlet oak, white oak.
UgwA:										
Urban land.										
Vistula	4S	Slight	Slight	Severe	Slight	Moderate	White oak Tuliptree Black cherry Black oak	70 87 --- 74	57 86 --- 57	Black cherry, black oak, bur oak, chinkapin oak, eastern white pine, red pine, scarlet oak, shingle oak, white oak.
UhbA:										
Urban land.										
Volinia	4A	Slight	Slight	Slight	Slight	Severe	Northern red oak Black oak	72 83	57 57	Shumard's oak, black cherry, black walnut, bur oak, chinkapin oak, eastern white pine, green ash, northern red oak, red pine, tuliptree, white ash, white oak.
VnxA:										
Vistula	4S	Slight	Slight	Moderate	Slight	Moderate	Black cherry Black oak Tuliptree White oak	--- 74 87 70	--- 57 86 57	Black cherry, black oak, bur oak, chinkapin oak, eastern white pine, red pine, scarlet oak, shingle oak, white oak.

See footnote at end of table.

Table 11.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume of wood fiber*	Suggested trees to plant
VolA:										
Volinia	4A	Slight	Slight	Slight	Slight	Severe	Northern red oak	72	57	Shumard's oak, black cherry, black walnut, bur oak, chinkapin oak, eastern white pine, green ash, northern red oak, red pine, tuliptree, white ash, white oak.
							Black oak	83	57	
WcnAI:										
Waterford	4W	Slight	Moderate	Slight	Moderate	Severe	Northern red oak	76	57	American sycamore, bur oak, green ash, pin oak, red maple, river birch, shingle oak, silver maple, swamp white oak.
							White ash	---	---	
							Green ash	---	---	
							Red maple	---	---	
							American sycamore	---	---	
							Eastern cottonwood	---	---	
							Quaking aspen	---	---	
							Bur oak	---	---	
WoaA:										
Williamstown	9A	Slight	Slight	Slight	Slight	Severe	Tuliptree	90	129	Shumard's oak, black cherry, black walnut, bur oak, chinkapin oak, eastern white pine, green ash, northern red oak, red pine, tuliptree, white ash, white oak.
							White ash	90	129	
WobB:										
Williamstown	9A	Slight	Slight	Slight	Slight	Severe	Tuliptree	90	129	Shumard's oak, black cherry, black walnut, bur oak, chinkapin oak, eastern white pine, green ash, northern red oak, red pine, tuliptree, white ash, white oak.
							White ash	90	129	

See footnote at end of table.

Table 11.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume of wood fiber*	Suggested trees to plant
WobB:										
Crosier	4A	Slight	Slight	Slight	Slight	Moderate	Northern red oak	75	57	American sycamore, Shumard's oak, bur oak, green ash, northern red oak, pin oak, red maple, river birch, shingle oak, silver maple, swamp white oak, white ash, white oak.
							Pin oak	85	72	
							Sweetgum	80	86	
							Tuliptree	85	86	
							White ash	75	57	
WocC2, WodC3:										
Williamstown	9A	Slight	Slight	Slight	Slight	Severe	Tuliptree	90	129	Shumard's oak, black cherry, black walnut, bur oak, chinkapin oak, eastern white pine, green ash, northern red oak, red pine, tuliptree, white ash, white oak.
							White ash	90	129	
WrxAN:										
Wunabuna	5W	Slight	Severe	Severe	Severe	Severe	Pin oak	86	72	American sycamore, bur oak, green ash, pin oak, red maple, river birch, silver maple, swamp white oak.
							Green ash	---	---	
							American sycamore	---	---	
							Silver maple	82	29	
							Eastern cottonwood	---	---	
							Black willow	---	---	
							American elm	---	---	

* Volume of wood fiber is the yield in cubic feet per acre per year calculated at the age of culmination of the mean annual increment for fully stocked natural stands.

Table 12.--Recreational Development

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AahAK:					
Abscota	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: droughty, flooding.
AbhAN, AbhAU:					
Adrian	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.
BaaA:					
Bainter	Slight	Slight	Slight	Slight	Moderate: droughty.
BaaB:					
Bainter	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
BbmA:					
Baugo	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
BlaA:					
Blount	Severe: wetness.	Moderate: percs slowly, wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
BlaB:					
Blount	Severe: wetness.	Moderate: percs slowly, wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
BshA:					
Brady	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
BteA:					
Brems	Moderate: too sandy, wetness.	Moderate: too sandy, wetness.	Moderate: small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
BteB:					
Brems	Moderate: too sandy, wetness.	Moderate: too sandy, wetness.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
BtxA:					
Bristol	Slight	Slight	Moderate: small stones.	Slight	Slight.
BtxB:					
Bristol	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
BtxC:					
Bristol	Slight	Slight	Severe: slope.	Slight	Slight.
BtxD2:					
Bristol	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
BtxE:					
Bristol	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
BufA:					
Bronson	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
BuuA:					
Brookston	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
CnbA, CnbB:					
Coloma	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
CnbC:					
Coloma	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty.
CosA:					
Cosperville	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly, small stones.	Slight	Moderate: droughty.
CosB:					
Cosperville	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly, slope, small stones.	Slight	Moderate: droughty.
CvdA, CvdB:					
Crosier	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
DcrA:					
Del Rey	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
DdeA:					
Desker	Slight	Slight	Moderate: small stones.	Slight	Moderate: droughty.
DdeB:					
Desker	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
EchAN, EchAU:					
Edwards	Severe: excess humus, percs slowly, ponding.	Severe: excess humus, percs slowly, ponding.	Severe: excess humus, percs slowly, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
GczA, GdnA:					
Gilford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
GlaB:					
Glynwood	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Moderate: wetness.	Slight.
GlaC:					
Glynwood	Moderate: wetness.	Moderate: wetness.	Severe: slope.	Moderate: wetness.	Slight.
GndA:					
Granby	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
GocAK:					
Gravelton	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
GodAI:					
Gravelton	Severe: flooding, ponding.	Severe: ponding.	Severe: flooding, ponding.	Severe: ponding.	Severe: flooding, ponding.
HhaAP:					
Histosols	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.
HtbAN, HtbAU:					
Houghton	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.
JaaAK:					
Jamestown	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
KimA:					
Kimmell	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
MfrAN:					
Madaus	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.
MftA:					
Matherton	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
MgcA:					
Maumee	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
MmdC2, MmdC3:					
Miami	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly, slope.	Severe: erodes easily.	Moderate: droughty.

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
MmdD2, MmdD3:					
Miami	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly, slope.	Severe: erodes easily.	Moderate: droughty, slope.
MouAN:					
Milford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
MsaA:					
Mishawaka	Slight	Slight	Moderate: small stones.	Slight	Moderate: droughty.
MvkA:					
Morocco	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
MwzAN, MwzAU:					
Muskego	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.
OmgA:					
Osolo	Moderate: too sandy.	Moderate: too sandy.	Moderate: small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
OmgB:					
Osolo	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
PaaAN:					
Palms	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.
PkdA:					
Pewamo	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Pmg:					
Pits	Severe: slope, small stones.	Severe: slope, small stones, too sandy.	Severe: slope, small stones, too sandy.	Severe: too sandy.	Severe: droughty, slope, small stones.
ReyAN:					
Rensselaer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
RopA:					
Riddles	Slight	Slight	Moderate: small stones.	Slight	Slight.
Oshtemo	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones.

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
RopB:					
Riddles	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Oshtemo	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones.
RoqC2:					
Riddles	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Metea	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
RoqD2:					
Riddles	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Metea	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, too sandy.	Severe: slope.
RosE:					
Riddles	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Tyner	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, too sandy.	Severe: slope.
ScuA, SdnA:					
Sebewa	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
SdzA:					
Selfridge	Severe: wetness.	Moderate: percs slowly, too sandy, wetness.	Severe: wetness.	Moderate: too sandy, wetness.	Moderate: droughty, wetness.
Crosier	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
SdzaB:					
Selfridge	Severe: wetness.	Moderate: percs slowly, too sandy, wetness.	Severe: wetness.	Moderate: too sandy, wetness.	Moderate: droughty, wetness.
Brems	Moderate: too sandy, wetness.	Moderate: too sandy, wetness.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
SnlA:					
Southwest	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
TxuA:					
Tyner	Moderate: too sandy.	Moderate: too sandy.	Moderate: small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
TxuB:					
Tyner	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
TxuC:					
Tyner	Moderate: too sandy.	Moderate: too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty.
TxuD:					
Tyner	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
TxuF:					
Tyner	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Uam:					
Udorthents, loamy	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: droughty.
Uaz:					
Psamments	Severe: too sandy.	Severe: too sandy.	Severe: small stones, too sandy.	Severe: too sandy.	Severe: droughty.
Uba:					
Psammaquents	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: too sandy, wetness.	Severe: droughty, wetness.
UdeA:					
Urban land.					
Bainter	Slight	Slight	Slight	Slight	Moderate: droughty.
UdkA:					
Urban land.					
Brady	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
UdoA:					
Urban land.					
Brems	Moderate: too sandy, wetness.	Moderate: too sandy, wetness.	Moderate: small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
UdpA:					
Urban land.					
Bristol	Slight	Slight	Moderate: small stones.	Slight	Slight.

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
UdpB:					
Urban land.					
Bristol	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
UdrA:					
Urban land.					
Bronson	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
UeaA:					
Urban land.					
Crosier	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
UeqA:					
Urban land.					
Gilford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
UfzA:					
Urban land.					
Mishawaka	Slight	Slight	Moderate: small stones.	Slight	Moderate: droughty.
UgaA:					
Urban land.					
Morocco	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
UglA:					
Urban land.					
Osolo	Moderate: too sandy.	Moderate: too sandy.	Moderate: small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
UgrA:					
Urban land.					
Rensselaer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
UgsB:					
Urban land.					
Riddles	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Oshtemo	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones.

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
UgvA:					
Urban land.					
Tyner	Moderate: too sandy.	Moderate: too sandy.	Moderate: small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
UgvB:					
Urban land.					
Tyner	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
UgwA:					
Urban land.					
Vistula	Slight	Slight	Moderate: small stones.	Slight	Slight.
UhbA:					
Urban land.					
Volinia	Slight	Slight	Slight	Slight	Moderate: droughty.
Usl:					
Udorthents, rubbish.					
VnxA:					
Vistula	Moderate: too sandy.	Moderate: too sandy.	Moderate: small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
VolA:					
Volinia	Slight	Slight	Slight	Slight	Moderate: droughty.
WcnAI:					
Waterford	Severe: flooding, wetness.	Severe: wetness.	Severe: flooding, wetness.	Severe: wetness.	Severe: flooding, wetness.
WoaA:					
Williamstown	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.	Moderate: wetness.
WobB:					
Williamstown	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.	Moderate: wetness.
Crosier	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
WocC2:					
Williamstown	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly, slope.	Severe: erodes easily.	Moderate: wetness.

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
WodC3:					
Williamstown-------	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly, slope.	Severe: erodes easily.	Moderate: wetness.
WrxAN:					
Wunabuna-----------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

Table 13.--Wildlife Habitat

(See text for definitions of terms used in this table. Absence of an entry indicates that the soil was not rated)

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
AahAK: Abscota----------	Fair	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
AbhAN: Adrian-----------	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Very poor	Good.
AbhAU: Adrian-----------	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
BaaA, BaaB: Bainter----------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
BbmA: Baugo------------	Fair	Good	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
BlaA: Blount-----------	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
BlaB: Blount-----------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
BshA: Brady------------	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
BteA, BteB: Brems------------	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Fair	Poor	Poor.
BtxA, BtxB: Bristol----------	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
BtxC, BtxD2: Bristol----------	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
BtxE: Bristol----------	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
BufA: Bronson----------	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Very poor.
BuuA: Brookston--------	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
CnbA, CnbB: Coloma-----------	Fair	Fair	Fair	Fair	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
CnbC: Coloma-----------	Poor	Fair	Fair	Fair	Good	Very poor.	Very poor.	Fair	Fair	Very poor.

Table 13.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hard-wood trees	Conif-erous plants	Wetland plants	Shallow water areas	Open-land wild-life	Wood-land wild-life	Wetland wildlife
CosA, CosB:										
Cosperville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CvdA:										
Crosier	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
CvdB:										
Crosier	Fair	Good	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
DcrA:										
Del Rey	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
DdeA, DdeB:										
Desker	Fair	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
EchAN:										
Edwards	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Very	Good.
EchAU:										
Edwards	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
GczA:										
Gilford	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
GdnA:										
Gilford	Fair	Poor	Poor	Poor	Poor	Good	Good	Fair	Poor	Good.
GlaB:										
Glynwood	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
GlaC:										
Glynwood	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
GndA:										
Granby	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
GocAK, GodAI:										
Gravelton	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
HhaAP:										
Histosols	Very poor.	Poor	Fair	Poor	Poor	Good	Good	Good	Poor	Good.
HtbAN:										
Houghton	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Very	Good.
HtbAU:										
Houghton	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
JaaAK:										
Jamestown	Fair	Good	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.

Table 13.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
KimA: Kimmell	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
MfrAN: Madaus	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Very poor.	Good.
MftA: Matherton	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
MgcA: Maumee	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
MmdC2, MmdC3: Miami	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MmdD2, MmdD3: Miami	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
MouAN: Milford	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
MsaA: Mishawaka	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
MvkA: Morocco	Poor	Fair	Good	Fair	Fair	Fair	Very poor.	Fair	Fair	Poor.
MwzAN: Muskego	Poor	Poor	Poor	Poor	Poor	Good	Good	Fair	Poor	Good.
MwzAU: Muskego	Very poor.	Very poor.	Poor poor.	Very poor.	Very poor.	Good	Good	Poor poor.	Poor poor.	Good.
OmgA, OmgB: Osolo	Poor	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Good	Very poor.
PaaAN: Palms	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
PkdA: Pewamo	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
Pmg: Pits	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Fair	Very poor.	Very poor.	Poor.
ReyAN: Rensselaer	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
RopA, RopB: Riddles	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

Table 13.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
RopA, RopB:										
Oshtemo	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
RoqC2:										
Riddles	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Metea	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
RoqD2:										
Riddles	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Metea	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
RosE:										
Riddles	Very poor.	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Tyner	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
ScuA:										
Sebewa	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
SdnA:										
Sebewa	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
SdzA:										
Selfridge	Fair	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair.
Crosier	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
SdzaB:										
Selfridge	Fair	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
Brems	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Fair	Poor	Poor.
SnlA:										
Southwest	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
TxuA, TxuB:										
Tyner	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
TxuC, TxuD:										
Tyner	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
TxuF:										
Tyner	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Uam:										
Udorthents, loamy	Fair	Good	Good	Good	Good	Fair	Fair	Fair	Good	Fair.

Table 13.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
Uaz:										
Psamments	Very poor.	Very	Poor	Very	Very	Very poor.	Very poor.	Very	Very	Very poor.
Uba:										
Psammaquents	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.
UdeA:										
Urban land.										
Bainter	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
UdkA:										
Urban land.										
Brady	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
UdoA:										
Urban land.										
Brems	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Fair	Poor	Poor.
UdpA, UdpB:										
Urban land.										
Bristol	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
UdrA:										
Urban land.										
Bronson	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Very poor.
UeaA:										
Urban land.										
Crosier	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
UeqA:										
Urban land.										
Gilford	Fair	Poor	Poor	Poor	Poor	Good	Good	Fair	Poor	Good.
UfzA:										
Urban land.										
Mishawaka	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
UgaA:										
Urban land.										
Morocco	Poor	Fair	Good	Fair	Fair	Fair	Very poor.	Fair	Fair	Poor.

Table 13.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
UglA:										
Urban land.										
Osolo	Poor	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Good	Very poor.
UgrA:										
Urban land.										
Rensselaer	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
UgsB:										
Urban land.										
Riddles	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Oshtemo	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
UgvA, UgvB:										
Urban land.										
Tyner	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
UgwA:										
Urban land.										
Vistula	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
UhbA:										
Urban land.										
Volinia	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Usl:										
Udorthents, rubbish.										
VnxA:										
Vistula	Poor	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
VolA:										
Volinia	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WcnAI:										
Waterford	Very	Poor	Fair	Good	Good	Fair	Poor	Poor	Fair	Fair.
WoaA:										
Williamstown	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
WobB:										
Williamstown	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

Table 13.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hard- wood trees	Conif- erous plants	Wetland plants	Shallow water areas	Open- land wild- life	Wood- land wild- life	Wetland wildlife
WobB:										
Crosier----------	Fair	Good	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
WocC2:										
Williamstown-----	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
WodC3:										
Williamstown-----	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
WrxAN:										
Wunabuna---------	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.

Table 14.--Building Site Development

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AahAK:						
Abscota	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: droughty, flooding.
AbhAN, AbhAU:						
Adrian	Severe: cutbanks cave, excess humus, ponding.	Severe: low strength, ponding, subsides.	Severe: ponding, subsides.	Severe: low strength, ponding, subsides.	Severe: frost action, ponding, subsides.	Severe: excess humus, ponding.
BaaA, BaaB:						
Bainter	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: droughty.
BbmA:						
Baugo	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength, wetness.	Severe: wetness.
BlaA, BlaB:						
Blount	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength.	Moderate: wetness.
BshA:						
Brady	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, wetness.	Severe: wetness.
BteA, BteB:						
Brems	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: droughty.
BtxA, BtxB:						
Bristol	Moderate: dense layer.	Slight	Slight	Slight	Slight	Slight.
BtxC:						
Bristol	Moderate: dense layer.	Slight	Slight	Moderate: slope.	Slight	Slight.
BtxD2:						
Bristol	Moderate: dense layer, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
BtxE:						
Bristol	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
BufA:						
Bronson	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: frost action.	Moderate: wetness.

Table 14.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
BuuA:						
Brookston	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, low strength, ponding.	Severe: ponding.
CnbA, CnbB:						
Coloma	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
CnbC:						
Coloma	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Severe: droughty.
CosA, CosB:						
Cosperville	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: droughty.
CvdA, CvdB:						
Crosier	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength, wetness.	Severe: wetness.
DcrA:						
Del Rey	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength, wetness.	Severe: wetness.
DdeA:						
Desker	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: droughty.
DdeB:						
Desker	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Moderate: droughty.
EchAN, EchAU:						
Edwards	Severe: excess humus, ponding.	Severe: low strength, ponding, subsides.	Severe: ponding, subsides.	Severe: low strength, ponding, subsides.	Severe: frost action, ponding, subsides.	Severe: excess humus, ponding.
GczA, GdnA:						
Gilford	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, ponding.	Severe: ponding.
GlaB:						
Glynwood	Severe: wetness.	Moderate: shrink-swell, wetness.	Severe: wetness.	Moderate: shrink-swell, wetness.	Severe: frost action, low strength.	Slight.
GlaC:						
Glynwood	Severe: wetness.	Moderate: shrink-swell, wetness.	Severe: wetness.	Moderate: shrink-swell, slope, wetness.	Severe: frost action, low strength.	Slight.

Table 14.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
GndA:						
Granby	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
GocAK:						
Gravelton	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, frost action, ponding.	Severe: ponding.
GodAI:						
Gravelton	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, frost action, ponding.	Severe: flooding, ponding.
HhaAP:						
Histosols	Severe: cutbanks cave, excess humus, ponding.	Severe: ponding, subsides.	Severe: ponding, subsides.	Severe: ponding, subsides.	Severe: ponding, subsides.	Severe: excess humus, ponding.
HtbAN, HtbAU:						
Houghton	Severe: excess humus, ponding.	Severe: low strength, ponding, subsides.	Severe: low strength, ponding, subsides.	Severe: low strength, ponding, subsides.	Severe: frost action, ponding, subsides.	Severe: excess humus, ponding.
JaaAK:						
Jamestown	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, low strength, wetness.	Severe: wetness.
KimA:						
Kimmell	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength, wetness.	Severe: wetness.
MfrAN:						
Madaus	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, ponding.	Severe: excess humus, ponding.
MftA:						
Matherton	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, wetness.	Severe: wetness.
MgcA:						
Maumee	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
MmdC2, MmdC3:						
Miami	Severe: wetness.	Moderate: shrink-swell, wetness.	Severe: wetness.	Moderate: shrink-swell, slope, wetness.	Severe: low strength.	Moderate: droughty.

Table 14.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
MmdD2, MmdD3:						
Miami	Severe: wetness.	Moderate: shrink-swell, slope, wetness.	Severe: wetness.	Severe: slope.	Severe: low strength.	Moderate: droughty, slope.
MouAN:						
Milford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, low strength, ponding.	Severe: ponding.
MsaA:						
Mishawaka	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
MvkA:						
Morocco	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
MwzAN, MwzAU:						
Muskego	Severe: excess humus, ponding.	Severe: ponding, subsides.	Severe: ponding, subsides.	Severe: ponding, subsides.	Severe: frost action, ponding, subsides.	Severe: excess humus, ponding.
OmgA, OmgB:						
Osolo	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Moderate: droughty.
PaaAN:						
Palms	Severe: excess humus, ponding.	Severe: ponding, subsides.	Severe: ponding, subsides.	Severe: ponding, subsides.	Severe: frost action, ponding, subsides.	Severe: excess humus, ponding.
PkdA:						
Pewamo	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, low strength, ponding.	Severe: ponding.
Pmg:						
Pits	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope, small stones.
ReyAN:						
Rensselaer	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, low strength, ponding.	Severe: ponding.
RopA, RopB:						
Riddles	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.	Slight.
Oshtemo	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: small stones.

Table 14.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
RoqC2:						
Riddles	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, slope.	Severe: slope.	Moderate: low strength, shrink-swell, slope.	Moderate: slope.
Metea	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: frost action, slope.	Moderate: droughty, slope.
RoqD2:						
Riddles	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Metea	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
RosE:						
Riddles	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Tyner	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
ScuA, SdnA:						
Sebewa	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, ponding.	Severe: ponding.
SdzA:						
Selfridge	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: droughty, wetness.
Crosier	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength, wetness.	Severe: wetness.
SdzaB:						
Selfridge	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: droughty, wetness.
Brems	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: droughty.
SnlA:						
Southwest	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, ponding.	Severe: ponding.
TxuA, TxuB:						
Tyner	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
TxuC:						
Tyner	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.

Table 14.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
TxuD:						
Tyner	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
TxuF:						
Tyner	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Uam:						
Udorthents, loamy	Moderate: wetness.	Moderate: shrink-swell.	Moderate: shrink-swell, wetness.	Moderate: shrink-swell, slope.	Moderate: low strength, shrink-swell.	Moderate: droughty.
Uaz:						
Psamments	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
Uba:						
Psammaquents	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: droughty, wetness.
UdeA:						
Urban land.						
Bainter	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: droughty.
UdkA:						
Urban land.						
Brady	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, wetness.	Severe: wetness.
UdoA:						
Urban land.						
Brems	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: droughty.
UdpA, UdpB:						
Urban land.						
Bristol	Moderate: dense layer.	Slight	Slight	Slight	Slight	Slight.
UdrA:						
Urban land.						
Bronson	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: frost action.	Moderate: wetness.
UeaA:						
Urban land.						
Crosier	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength, wetness.	Severe: wetness.

Table 14.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
UeqA:						
Urban land.						
Gilford	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, ponding.	Severe: ponding.
UfzA:						
Urban land.						
Mishawaka	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
UgaA:						
Urban land.						
Morocco	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
UglA:						
Urban land.						
Osolo	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Moderate: droughty.
UgrA:						
Urban land.						
Rensselaer	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, ponding.	Severe: ponding.
UgsB:						
Urban land.						
Riddles	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, shrink-swell.	Slight.
Oshtemo	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: small stones.
UgvA, UgvB:						
Urban land.						
Tyner	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
UgwA:						
Urban land.						
Vistula	Moderate: dense layer.	Slight	Slight	Slight	Slight	Slight.
UhbA:						
Urban land.						
Volinia	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: droughty.
Usl:						
Udorthents, rubbish.						

Table 14.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
VnxA:						
Vistula	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Moderate: droughty.
VolA:						
Volinia	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: droughty.
WcnAI:						
Waterford	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action, wetness.	Severe: flooding, wetness.
WoaA:						
Williamstown	Severe: wetness.	Moderate: shrink-swell, wetness.	Severe: wetness.	Moderate: shrink-swell, wetness.	Severe: low strength.	Moderate: wetness.
WobB:						
Williamstown	Severe: wetness.	Moderate: shrink-swell, wetness.	Severe: wetness.	Moderate: shrink-swell, wetness.	Severe: low strength.	Moderate: wetness.
Crosier	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength, wetness.	Severe: wetness.
WocC2, WodC3:						
Williamstown	Severe: wetness.	Moderate: shrink-swell, wetness.	Severe: wetness.	Moderate: shrink-swell, slope, wetness.	Severe: low strength.	Moderate: wetness.
WrxAN:						
Wunabuna	Severe: excess humus, ponding.	Severe: ponding.	Severe: low strength, ponding.	Severe: ponding.	Severe: frost action, low strength, ponding.	Severe: ponding.

Table 15.--Sanitary Facilities

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AahAK:					
Abscota	Severe: flooding, poor filter, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy.
AbhAN, AbhAU:					
Adrian	Severe: percs slowly, ponding, subsides.	Severe: excess humus, ponding, seepage.	Severe: ponding, seepage, too sandy.	Severe: ponding, seepage.	Poor: ponding, seepage, too sandy.
BaaA, BaaB:					
Bainter	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
BbmA:					
Baugo	Severe: percs slowly, poor filter, wetness.	Severe: seepage.	Severe: too sandy, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
BlaA, BlaB:					
Blount	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
BshA:					
Brady	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: thin layer, wetness.
BteA, BteB:					
Brems	Severe: poor filter, wetness.	Severe: seepage, wetness.	Severe: seepage, too sandy, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy.
BtxA, BtxB:					
Bristol	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
BtxC, BtxD2:					
Bristol	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: seepage.
BtxE:					
Bristol	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, slope.
BufA:					
Bronson	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: thin layer.

Table 15.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
BuuA:					
Brookston	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
CnbA, CnbB:					
Coloma	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
CnbC:					
Coloma	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
CosA, CosB:					
Cosperville	Severe: percs slowly, wetness.	Severe: wetness.	Severe: seepage, too clayey.	Slight	Poor: hard to pack, too clayey.
CvdA:					
Crosier	Severe: percs slowly, wetness.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Poor: wetness.
CvdB:					
Crosier	Severe: percs slowly, wetness.	Moderate: seepage, slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
DcrA:					
Del Rey	Severe: percs slowly, wetness.	Slight	Severe: too clayey, wetness.	Severe: wetness.	Poor: hard to pack, too clayey, wetness.
DdeA, DdeB:					
Desker	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, small stones, too sandy.
EchAN, EchAU:					
Edwards	Severe: percs slowly, ponding, subsides.	Severe: excess humus, ponding, seepage.	Severe: excess humus, ponding.	Severe: ponding, seepage.	Poor: excess humus, ponding.
GczA, GdnA:					
Gilford	Severe: ponding, poor filter.	Severe: ponding, seepage.	Severe: ponding, seepage.	Severe: ponding, seepage.	Poor: ponding, thin layer.
GlaB, GlaC:					
Glynwood	Severe: percs slowly, wetness.	Moderate: slope.	Moderate: too clayey, wetness.	Moderate: wetness.	Fair: too clayey, wetness.
GndA:					
Granby	Severe: ponding, poor filter.	Severe: ponding, seepage.	Severe: ponding, seepage, too sandy.	Severe: ponding, seepage.	Poor: ponding, seepage, too sandy.

Table 15.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
GocAK, GodAI:					
Gravelton	Severe: flooding, ponding, poor filter.	Severe: flooding, ponding, seepage.	Severe: flooding, ponding, seepage.	Severe: flooding, ponding, seepage.	Poor: seepage, small stones, too sandy.
HhaAP:					
Histosols	Severe: ponding.	Severe: excess humus, seepage.	Severe: ponding, seepage.	Severe: ponding, seepage.	Poor: excess humus, ponding.
HtbAN, HtbAU:					
Houghton	Severe: percs slowly, ponding, subsides.	Severe: excess humus, ponding, seepage.	Severe: excess humus, ponding, seepage.	Severe: ponding, seepage.	Poor: excess humus, ponding.
JaaAK:					
Jamestown	Severe: flooding, percs slowly, wetness.	Severe: flooding, seepage.	Severe: flooding, wetness.	Severe: flooding, seepage, wetness.	Poor: wetness.
KimA:					
Kimmell	Severe: percs slowly, wetness.	Slight	Severe: seepage, wetness.	Severe: wetness.	Poor: thin layer, wetness.
MfrAN:					
Madaus	Severe: percs slowly, ponding.	Severe: excess humus, ponding, seepage.	Severe: ponding, seepage.	Severe: ponding, seepage.	Poor: ponding.
MftA:					
Matherton	Severe: poor filter, wetness.	Severe: seepage, wetness.	Severe: seepage, too sandy, wetness.	Severe: seepage, wetness.	Poor: seepage, small stones, too sandy.
MgcA:					
Maumee	Severe: ponding, poor filter.	Severe: ponding, seepage.	Severe: ponding, seepage, too sandy.	Severe: ponding, seepage.	Poor: ponding, seepage, too sandy.
MmdC2, MmdC3:					
Miami	Severe: percs slowly, wetness.	Severe: slope.	Moderate: wetness.	Moderate: wetness.	Fair: wetness.
MmdD2, MmdD3:					
Miami	Severe: percs slowly, wetness.	Severe: slope.	Moderate: slope, wetness.	Moderate: slope, wetness.	Fair: slope, wetness.
MouAN:					
Milford	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: hard to pack, ponding, too clayey.

Table 15.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
MsaA:					
Mishawaka	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
MvkA:					
Morocco	Severe: poor filter, wetness.	Severe: seepage, wetness.	Severe: seepage, too sandy, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
MwzAN:					
Muskego	Severe: ponding, subsides.	Severe: excess humus, ponding, seepage.	Severe: excess humus, ponding.	Severe: ponding, seepage.	Poor: hard to pack, ponding.
MwzAU:					
Muskego	Severe: ponding, subsides.	Severe: excess humus, ponding, seepage.	Severe: excess humus, ponding.	Severe: ponding, seepage.	Poor: hard to pack, ponding.
OmgA, OmgB:					
Osolo	Severe: poor filter, wetness.	Severe: seepage.	Severe: seepage, too sandy, wetness.	Severe: seepage.	Poor: seepage, too sandy.
PaaAN:					
Palms	Severe: percs slowly, ponding, subsides.	Severe: excess humus, ponding, seepage.	Severe: excess humus, ponding.	Severe: ponding, seepage.	Poor: excess humus, ponding.
PkdA:					
Pewamo	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: hard to pack, ponding, too clayey.
Pmg:					
Pits	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, small stones, too sandy.
ReyAN:					
Rensselaer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
RopA, RopB:					
Riddles	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Fair: small stones.
Oshtemo	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
RoqC2, RoqD2:					
Riddles	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope, small stones.

Table 15.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
RoqC2, RoqD2:					
Metea	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy, slope.
RosE:					
Riddles	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Tyner	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, slope, too sandy.
ScuA, SdnA:					
Sebewa	Severe: ponding, poor filter.	Severe: ponding, seepage.	Severe: ponding, seepage, too sandy.	Severe: ponding, seepage.	Poor: seepage, small stones, too sandy.
SdzA:					
Selfridge	Severe: percs slowly, poor filter, wetness.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Poor: wetness.
Crosier	Severe: percs slowly, wetness.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Poor: wetness.
SdzaB:					
Selfridge	Severe: percs slowly, poor filter, wetness.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Poor: wetness.
Brems	Severe: poor filter, wetness.	Severe: seepage, wetness.	Severe: seepage, too sandy, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy.
SnlA:					
Southwest	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
TxuA, TxuB:					
Tyner	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
TxuC, TxuD:					
Tyner	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
TxuF:					
Tyner	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, slope, too sandy.

Table 15.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Uam:					
Udorthents, loamy	Severe: percs slowly, wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Fair: wetness.
Uaz:					
Psamments	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Uba:					
Psammaquents	Severe: poor filter, wetness.	Severe: seepage, wetness.	Severe: seepage, too sandy, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
UdeA:					
Urban land.					
Bainter	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
UdkA:					
Urban land.					
Brady	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: thin layer, wetness.
UdoA:					
Urban land.					
Brems	Severe: poor filter, wetness.	Severe: seepage, wetness.	Severe: seepage, too sandy, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy.
UdpA, UdpB:					
Urban land.					
Bristol	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
UdrA:					
Urban land.					
Bronson	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: thin layer.
UeaA:					
Urban land.					
Crosier	Severe: percs slowly, wetness.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Poor: wetness.
UeqA:					
Urban land.					
Gilford	Severe: ponding, poor filter.	Severe: ponding, seepage.	Severe: ponding, seepage.	Severe: ponding, seepage.	Poor: ponding, thin layer.

Table 15.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
UfzA:					
Urban land.					
Mishawaka	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
UgaA:					
Urban land.					
Morocco	Severe: poor filter, wetness.	Severe: seepage, wetness.	Severe: seepage, too sandy, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
UglA:					
Urban land.					
Osolo	Severe: poor filter, wetness.	Severe: seepage.	Severe: seepage, too sandy, wetness.	Severe: seepage.	Poor: seepage, too sandy.
UgrA:					
Urban land.					
Rensselaer	Severe: percs slowly, ponding, poor filter.	Severe: ponding, seepage.	Severe: ponding.	Severe: ponding, seepage.	Poor: ponding, thin layer.
UgsB:					
Urban land.					
Riddles	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Oshtemo	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
UgvA, UgvB:					
Urban land.					
Tyner	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
UgwA:					
Urban land.					
Vistula	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
UhbA:					
Urban land.					
Volinia	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Usl:					
Udorthents, rubbish.					

Table 15.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
VnxA:					
Vistula	Severe: poor filter, wetness.	Severe: seepage.	Severe: seepage, wetness.	Severe: seepage.	Poor: seepage.
VolA:					
Volinia	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
WcnAI:					
Waterford	Severe: flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: wetness.
WoaA:					
Williamstown	Severe: percs slowly, wetness.	Slight	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
WobB:					
Williamstown	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
Crosier	Severe: percs slowly, wetness.	Moderate: seepage, slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
WocC2, WodC3:					
Williamstown	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
WrxAN:					
Wunabuna	Severe: ponding.	Severe: excess humus, ponding, seepage.	Severe: excess humus, ponding, seepage.	Severe: ponding, seepage.	Poor: excess humus, ponding.

Table 16.--Construction Materials

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
AahAK:				
Abscota	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
AbhAN, AbhAU:				
Adrian	Poor: wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.
BaaA, BaaB:				
Bainter	Good	Probable	Probable	Poor: area reclaim, small stones.
BbmA:				
Baugo	Poor: wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: wetness.
BlaA, BlaB:				
Blount	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
BshA:				
Brady	Poor: wetness.	Probable	Probable	Poor: small stones, wetness.
BteA, BteB:				
Brems	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
BtxA, BtxB, BtxC, BtxD2:				
Bristol	Good	Probable	Probable	Poor: small stones.
BtxE:				
Bristol	Fair: slope.	Probable	Probable	Poor: slope, small stones.
BufA:				
Bronson	Fair: wetness.	Probable	Probable	Poor: area reclaim, small stones.
BuuA:				
Brookston	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
CnbA, CnbB, CnbC:				
Coloma	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
CosA, CosB:				
Cosperville	Good	Probable	Improbable: too sandy.	Poor: too clayey.

Table 16.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
CvdA, CvdB:				
Crosier	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
DcrA:				
Del Rey	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
DdeA, DdeB:				
Desker	Good	Probable	Probable	Poor: area reclaim, small stones.
EchAN, EchAU:				
Edwards	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
GczA, GdnA:				
Gilford	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
GlaB, GlaC:				
Glynwood	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
GndA:				
Granby	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
GocAK, GodAI:				
Gravelton	Poor: wetness.	Probable	Probable	Poor: area reclaim, small stones, too sandy.
HhaAP:				
Histosols	Poor: wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.
HtbAN, HtbAU:				
Houghton	Poor: low strength, wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
JaaAK:				
Jamestown	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
KimA:				
Kimmell	Poor: wetness.	Probable	Probable	Poor: too clayey, wetness.
MfrAN:				
Madaus	Poor: wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.

Table 16.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
MftA:				
Matherton	Poor: wetness.	Probable	Probable	Poor: area reclaim, small stones, wetness.
MgcA:				
Maumee	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
MmdC2, MmdC3:				
Miami	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey.
MmdD2, MmdD3:				
Miami	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, slope, too clayey.
MouAN:				
Milford	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
MsaA:				
Mishawaka	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
MvkA:				
Morocco	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
MwzAN, MwzAU:				
Muskego	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.
OmgA, OmgB:				
Osolo	Good	Probable	Improbable: too sandy.	Fair: small stones, thin layer, too sandy.
PaaAN:				
Palms	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
PkdA:				
Pewamo	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, too clayey, wetness.
Pmg:				
Pits	Fair: slope.	Probable	Probable	Poor: area reclaim, small stones, too sandy.

Table 16.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
ReyAN:				
Rensselaer	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
RopA, RopB:				
Riddles	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Oshtemo	Good	Probable	Probable	Poor: small stones.
RoqC2:				
Riddles	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Metea	Good	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
RoqD2:				
Riddles	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Metea	Fair: slope.	Improbable: thin layer.	Improbable: too sandy.	Poor: slope, too sandy.
RosE:				
Riddles	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Tyner	Fair: slope.	Probable	Improbable: too sandy.	Poor: slope, too sandy.
ScuA, SdnA:				
Sebewa	Poor: wetness.	Probable	Probable	Poor: area reclaim, small stones, wetness.
SdzA:				
Selfridge	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
Crosier	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
SdzaB:				
Selfridge	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
Brems	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
SnlA:				
Southwest	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
TxuA, TxuB:				
Tyner	Good	Probable	Improbable: too sandy.	Poor: too sandy.

Table 16.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
TxuC, TxuD:				
Tyner	Good	Probable	Improbable: too sandy.	Poor: too sandy.
TxuF:				
Tyner	Poor: slope.	Probable	Improbable: too sandy.	Poor: slope, too sandy.
Uam:				
Udorthents, loamy	Fair: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Uaz:				
Psamments	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
Uba:				
Psammaquents	Good	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
UdeA:				
Urban land.				
Bainter	Good	Probable	Probable	Poor: area reclaim, small stones.
UdkA:				
Urban land.				
Brady	Poor: wetness.	Probable	Probable	Poor: small stones, wetness.
UdoA:				
Urban land.				
Brems	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
UdpA, UdpB:				
Urban land.				
Bristol	Good	Probable	Probable	Poor: small stones.
UdrA:				
Urban land.				
Bronson	Fair: wetness.	Probable	Probable	Poor: area reclaim, small stones.
UeaA:				
Urban land.				
Crosier	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

Table 16.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
UeqA:				
Urban land.				
Gilford	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
UfzA:				
Urban land.				
Mishawaka	Good	Probable	Improbable: too sandy.	Poor: small stones, too sandy.
UgaA:				
Urban land.				
Morocco	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
UglA:				
Urban land.				
Osolo	Good	Probable	Improbable: too sandy.	Fair: small stones, thin layer, too sandy.
UgrA:				
Urban land.				
Rensselaer	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, wetness.
UgsB:				
Urban land.				
Riddles	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Oshtemo	Good	Probable	Probable	Poor: small stones.
UgvA, UgvB:				
Urban land.				
Tyner	Good	Probable	Improbable: too sandy.	Poor: too sandy.
UgwA:				
Urban land.				
Vistula	Good	Probable	Probable	Poor: small stones.
UhbA:				
Urban land.				
Volinia	Good	Probable	Probable	Poor: small stones, too sandy.

Table 16.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
Usl:				
Udorthents, rubbish.				
VnxA:				
Vistula	Good	Probable	Probable	Poor: small stones.
VolA:				
Volinia	Good	Probable	Probable	Poor: small stones, too sandy.
WcnAI:				
Waterford	Poor: wetness.	Probable	Probable	Poor: area reclaim, wetness.
WoaA:				
Williamstown	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, too clayey.
WobB:				
Williamstown	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, too clayey.
Crosier	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
WocC2, WodC3:				
Williamstown	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, too clayey.
WrxAN:				
Wunabuna	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: wetness.

Table 17.--Water Management

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
AahAK:							
Abscota	Severe: seepage.	Severe: piping, seepage.	Severe: cutbanks cave.	Cutbanks cave, flooding.	Droughty, wetness.	Soil blowing, too sandy, wetness.	Droughty.
AbhAN:							
Adrian	Severe: seepage.	Severe: piping, ponding, seepage.	Severe: cutbanks cave.	Frost action, ponding, subsides.	Rooting depth, ponding, soil blowing.	Ponding, soil blowing, too sandy.	Rooting depth, wetness.
AbhAU:							
Adrian	Severe: seepage.	Severe: piping, ponding, seepage.	Severe: cutbanks cave.	Frost action, ponding, subsides.	Rooting depth, ponding, soil blowing.	Ponding, soil blowing, too sandy.	Rooting depth, wetness.
BaaA:							
Bainter	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, soil blowing.	Soil blowing	Droughty.
BaaB:							
Bainter	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, soil blowing.	Soil blowing	Droughty.
BbmA:							
Baugo	Severe: seepage.	Severe: piping, seepage, wetness.	Severe: no water.	Cutbanks cave, frost action.	Droughty, percs slowly, wetness.	Erodes easily, too sandy, wetness.	Droughty, erodes easily, wetness.
BlaA:							
Blount	Slight	Moderate: piping, wetness.	Severe: no water.	Frost action, percs slowly.	Percs slowly, wetness.	Erodes easily, percs slowly, wetness.	Erodes easily, rooting depth, wetness.
BlaB:							
Blount	Slight	Moderate: piping, wetness.	Severe: no water.	Frost action, percs slowly.	Percs slowly, wetness.	Erodes easily, percs slowly, wetness.	Erodes easily, rooting depth, wetness.

Table 17.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
BshA:							
Brady	Severe: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Frost action	Wetness	Soil blowing, wetness.	Wetness.
BteA:							
Brems	Severe: seepage.	Severe: piping, seepage.	Severe: cutbanks cave.	Cutbanks cave	Droughty, wetness.	Soil blowing, too sandy, wetness.	Droughty, rooting depth.
BteB:							
Brems	Severe: seepage.	Severe: piping, seepage.	Severe: cutbanks cave.	Cutbanks cave	Droughty, wetness.	Soil blowing, too sandy, wetness.	Droughty, rooting depth.
BtxA:							
Bristol	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Favorable	Favorable	Favorable.
BtxB:							
Bristol	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Slope	Favorable	Favorable.
BtxC:							
Bristol	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Slope	Favorable	Favorable.
BtxD2:							
Bristol	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Slope	Slope	Slope.
BtxE:							
Bristol	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Slope	Slope	Slope.
BufA:							
Bronson	Severe: seepage.	Severe: thin layer, wetness.	Severe: cutbanks cave.	Cutbanks cave, frost action.	Wetness	Soil blowing, wetness.	Favorable.

Table 17.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
BuuA:							
Brookston	Moderate: seepage.	Severe: ponding.	Severe: no water.	Frost action, ponding.	Ponding	Ponding	Wetness.
CnbA:							
Coloma	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake.	Soil blowing, too sandy.	Droughty.
CnbB:							
Coloma	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
CnbC:							
Coloma	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
CosA:							
Cosperville	Slight	Moderate: hard to pack, piping, thin layer.	Severe: no water.	Deep to water	Droughty	Favorable	Droughty.
CosB:							
Cosperville	Moderate: slope.	Moderate: hard to pack, piping, thin layer.	Severe: no water.	Deep to water	Droughty, slope.	Favorable	Droughty.
CvdA:							
Crosier	Moderate: seepage.	Severe: piping, wetness.	Severe: no water.	Frost action, percs slowly.	Droughty, wetness.	Erodes easily, wetness.	Droughty, erodes easily, wetness.
CvdB:							
Crosier	Moderate: seepage.	Severe: piping, wetness.	Severe: no water.	Frost action, percs slowly.	Droughty, wetness.	Erodes easily, wetness.	Droughty, erodes easily, wetness.
DcrA:							
Del Rey	Slight	Severe: wetness.	Severe: no water.	Frost action, percs slowly.	Percs slowly, wetness.	Erodes easily, percs slowly, wetness.	Erodes easily, percs slowly, wetness.

Table 17.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
DdeA:							
Desker	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, soil blowing.	Soil blowing, too sandy.	Droughty, rooting depth.
DdeB:							
Desker	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, slope, soil blowing.	Soil blowing, too sandy.	Droughty, rooting depth.
EchAN:							
Edwards	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Percs slowly, ponding, subsides.	Percs slowly, ponding, soil blowing.	Ponding, soil blowing.	Percs slowly, wetness.
EchAU:							
Edwards	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Percs slowly, ponding, subsides.	Percs slowly, ponding, soil blowing.	Ponding, soil blowing.	Percs slowly, wetness.
GczA:							
Gilford	Severe: seepage.	Severe: piping, ponding.	Severe: cutbanks cave.	Frost action, ponding.	Rooting depth, ponding, soil blowing.	Ponding, soil blowing.	Rooting depth, wetness.
GdnA:							
Gilford	Severe: seepage.	Severe: piping, ponding.	Severe: cutbanks cave.	Frost action, ponding.	Rooting depth, ponding, soil blowing.	Ponding, soil blowing.	Rooting depth, wetness.
GlaB:							
Glynwood	Moderate: slope.	Moderate: piping, wetness.	Severe: no water.	Frost action, percs slowly, slope.	Slope, wetness.	Erodes easily, wetness.	Erodes easily, rooting depth.
GlaC:							
Glynwood	Moderate: slope.	Moderate: piping, wetness.	Severe: no water.	Frost action, percs slowly, slope.	Slope, wetness.	Erodes easily, wetness.	Erodes easily, rooting depth.
GndA:							
Granby	Severe: seepage.	Severe: piping, ponding, seepage.	Severe: cutbanks cave.	Cutbanks cave, ponding.	Droughty, fast intake, ponding.	Ponding, soil blowing, too sandy.	Droughty, wetness.

Table 17.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
GocAK:							
Gravelton----------	Severe: seepage.	Severe: piping, ponding, seepage.	Severe: cutbanks cave.	Flooding, frost action, ponding.	Droughty, ponding.	Ponding, soil blowing, too sandy.	Droughty, rooting depth, wetness.
GodAI:							
Gravelton----------	Severe: seepage.	Severe: piping, ponding, seepage.	Severe: cutbanks cave.	Flooding, frost action, ponding.	Droughty, ponding.	Ponding, soil blowing, too sandy.	Droughty, rooting depth, wetness.
HhaAP:							
Histosols----------	Severe: seepage.	Severe: excess humus, ponding.	Severe: cutbanks cave.	Ponding, subsides.	Ponding-------	Ponding-------	Wetness.
HtbAN:							
Houghton-----------	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Frost action, ponding, subsides.	Ponding, soil blowing.	Ponding, soil blowing.	Wetness.
HtbAU:							
Houghton-----------	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Frost action, ponding, subsides.	Ponding, soil blowing.	Ponding, soil blowing.	Wetness.
JaaAK:							
Jamestown----------	Severe: seepage.	Severe: piping, wetness.	Severe: no water.	Flooding, frost action.	Flooding, percs slowly, wetness.	Wetness-------	Wetness.
KimA:							
Kimmell------------	Slight--------	Severe: wetness.	Severe: no water.	Frost action, percs slowly.	Droughty, percs slowly, wetness.	Percs slowly, wetness.	Droughty, rooting depth, wetness.
MfrAN:							
Madaus-------------	Severe: seepage.	Severe: ponding.	Severe: cutbanks cave, slow refill.	Frost action, percs slowly, ponding.	Percs slowly, ponding, soil blowing.	Percs slowly, ponding, soil blowing.	Percs slowly, wetness.
MftA:							
Matherton----------	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Cutbanks cave, frost action.	Wetness-------	Too sandy, wetness.	Rooting depth, wetness.

Table 17.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Limitations for-- Aquifer-fed excavated ponds	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
MgcA:							
Maumee	Severe: seepage.	Severe: piping, ponding, seepage.	Severe: cutbanks cave.	Cutbanks cave, ponding.	Droughty, fast intake, ponding.	Ponding, soil blowing, too sandy.	Droughty, rooting depth, wetness.
MmdC2:							
Miami	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Droughty, slope, wetness.	Erodes easily, wetness.	Droughty, erodes easily.
MmdC3:							
Miami	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Droughty, slope, wetness.	Erodes easily, wetness.	Droughty, erodes easily.
MmdD2:							
Miami	Severe: slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Droughty, slope, wetness.	Erodes easily, slope, wetness.	Droughty, erodes easily, slope.
MmdD3:							
Miami	Severe: slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Droughty, slope, wetness.	Erodes easily, slope, wetness.	Droughty, erodes easily, slope.
MouAN:							
Milford	Slight	Severe: ponding.	Severe: slow refill.	Frost action, ponding.	Ponding	Erodes easily, ponding.	Erodes easily, wetness.
MsaA:							
Mishawaka	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Rooting depth, droughty, soil blowing.	Soil blowing, too sandy.	Droughty, rooting depth.
MvkA:							
Morocco	Severe: seepage.	Severe: piping, seepage, wetness.	Severe: cutbanks cave.	Cutbanks cave	Droughty, fast intake, wetness.	Soil blowing, too sandy, wetness.	Droughty, wetness.
MwzAN:							
Muskego	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Percs slowly, ponding.	Percs slowly, ponding, soil blowing.	Percs slowly, ponding, soil blowing.	Percs slowly, wetness.

Table 17.--Water Management--Continued

Map symbol and soil name	Limitations for--: Pond reservoir areas	Limitations for--: Embankments, dikes, and levees	Limitations for--: Aquifer-fed excavated ponds	Features affecting--: Drainage	Features affecting--: Irrigation	Features affecting--: Terraces and diversions	Features affecting--: Grassed waterways
MwzAU:							
Muskego	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Percs slowly, ponding.	Percs slowly, ponding, soil blowing.	Percs slowly, ponding, soil blowing.	Percs slowly, wetness.
OmgA:							
Osolo	Severe: seepage.	Severe: piping, seepage.	Severe: cutbanks cave.	Deep to water	Droughty, fast intake.	Soil blowing, too sandy.	Droughty.
OmgB:							
Osolo	Severe: seepage.	Severe: piping, seepage.	Severe: cutbanks cave.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
PaaAN:							
Palms	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Frost action, ponding, subsides.	Ponding, soil blowing.	Ponding, soil blowing.	Rooting depth, wetness.
PkdA:							
Pewamo	Slight	Severe: ponding.	Severe: slow refill.	Frost action, ponding.	Ponding	Erodes easily, ponding.	Erodes easily, wetness.
Pmg:							
Pits	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, too sandy.	Droughty, rooting depth, slope.
ReyAN:							
Rensselaer	Moderate: seepage.	Severe: ponding, thin layer.	Severe: cutbanks cave.	Frost action, ponding.	Ponding	Ponding	Wetness.
RopA:							
Riddles	Moderate: seepage.	Moderate: piping, thin layer.	Severe: no water.	Deep to water	Soil blowing	Soil blowing	Favorable.
Oshtemo	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Fast intake, soil blowing.	Soil blowing, too sandy.	Favorable.

Table 17.--Water Management--Continued

Map symbol and soil name	Limitations for--: Pond reservoir areas	Limitations for--: Embankments, dikes, and levees	Limitations for--: Aquifer-fed excavated ponds	Features affecting--: Drainage	Features affecting--: Irrigation	Features affecting--: Terraces and diversions	Features affecting--: Grassed waterways
RopB:							
Riddles	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Slope, soil blowing.	Soil blowing	Favorable.
Oshtemo	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Fast intake, slope, soil blowing.	Soil blowing, too sandy.	Favorable.
RoqC2:							
Riddles	Severe: slope.	Moderate: piping, thin layer.	Severe: no water.	Deep to water	Slope	Slope	Slope.
Metea	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, rooting depth, slope.
RoqD2:							
Riddles	Severe: slope.	Moderate: piping, thin layer.	Severe: no water.	Deep to water	Slope	Slope	Slope.
Metea	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, rooting depth, slope.
RosE:							
Riddles	Severe: slope.	Moderate: piping, thin layer.	Severe: no water.	Deep to water	Slope	Slope	Slope.
Tyner	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, slope.
ScuA:							
Sebewa	Severe: seepage.	Severe: ponding, seepage.	Severe: cutbanks cave.	Cutbanks cave, frost action, ponding.	Rooting depth, ponding.	Ponding, too sandy.	Rooting depth, wetness.
SdnA:							
Sebewa	Severe: seepage.	Severe: ponding, seepage.	Severe: cutbanks cave.	Cutbanks cave, frost action, ponding.	Rooting depth, ponding.	Ponding, too sandy.	Rooting depth, wetness.

Table 17.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
SdzA:							
Selfridge	Severe: seepage.	Moderate: piping, wetness.	Severe: no water.	Frost action	Droughty, wetness.	Erodes easily, soil blowing, wetness.	Droughty, erodes easily, wetness.
Crosier	Moderate: seepage.	Severe: piping, wetness.	Severe: no water.	Frost action, percs slowly.	Droughty, wetness.	Erodes easily, wetness.	Droughty, erodes easily, wetness.
SdzaB:							
Selfridge	Severe: seepage.	Moderate: piping, wetness.	Severe: no water.	Frost action	Droughty, wetness.	Erodes easily, soil blowing, wetness.	Droughty, erodes easily, wetness.
Brems	Severe: seepage.	Severe: piping, seepage.	Severe: cutbanks cave.	Cutbanks cave	Droughty, wetness.	Soil blowing, too sandy, wetness.	Droughty, rooting depth.
SnlA:							
Southwest	Moderate: seepage.	Severe: piping, ponding.	Severe: slow refill.	Frost action, ponding.	Ponding	Erodes easily, ponding.	Erodes easily, wetness.
TxuA:							
Tyner	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake.	Soil blowing, too sandy.	Droughty.
TxuB:							
Tyner	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
TxuC:							
Tyner	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
TxuD:							
Tyner	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, slope.
TxuF:							
Tyner	Severe: seepage, slope.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, soil blowing, too sandy.	Droughty, slope.

Table 17.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Limitations for-- Aquifer-fed excavated ponds	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
Uam:							
Udorthents, loamy	Moderate: slope.	Moderate: piping, wetness.	Severe: no water.	Slope	Droughty, slope, wetness.	Erodes easily, wetness.	Droughty, erodes easily.
Uaz:							
Psamments	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty, rooting depth.
Uba:							
Psammaquents	Severe: seepage.	Severe: piping, seepage.	Severe: cutbanks cave.	Cutbanks cave	Droughty, fast intake.	Wetness, too sandy.	Droughty.
UdeA:							
Urban land.							
Bainter	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, soil blowing.	Soil blowing	Droughty.
UdkA:							
Urban land.							
Brady	Severe: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Frost action	Wetness	Soil blowing, wetness.	Wetness.
UdoA:							
Urban land.							
Brems	Severe: seepage.	Severe: piping, seepage.	Severe: cutbanks cave.	Cutbanks cave	Droughty, wetness.	Soil blowing, too sandy, wetness.	Droughty, rooting depth.
UdpA:							
Urban land.							
Bristol	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Favorable	Favorable	Favorable.

Table 17.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
UdpB:							
Urban land.							
Bristol	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Slope	Favorable	Favorable.
UdrA:							
Urban land.							
Bronson	Severe: seepage.	Severe: thin layer, wetness.	Severe: cutbanks cave.	Cutbanks cave, frost action.	Wetness	Soil blowing, wetness.	Favorable.
UeaA:							
Urban land.							
Crosier	Moderate: seepage.	Severe: piping, wetness.	Severe: no water.	Frost action, percs slowly.	Droughty, wetness.	Erodes easily, wetness.	Droughty, erodes easily, wetness.
UeqA:							
Urban land.							
Gilford	Severe: seepage.	Severe: piping, ponding.	Severe: cutbanks cave.	Frost action, ponding.	Rooting depth, ponding, soil blowing.	Ponding, soil blowing.	Rooting depth, wetness.
UfzA:							
Urban land.							
Mishawaka	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Rooting depth, droughty, soil blowing.	Soil blowing, too sandy.	Droughty, rooting depth.
UgaA:							
Urban land.							
Morocco	Severe: seepage.	Severe: piping, seepage, wetness.	Severe: cutbanks cave.	Cutbanks cave	Droughty, fast intake, wetness.	Soil blowing, too sandy, wetness.	Droughty, wetness.

Table 17.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Limitations for-- Aquifer-fed excavated ponds	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
UglA:							
Urban land.							
Osolo	Severe: seepage.	Severe: piping, seepage.	Severe: cutbanks cave.	Deep to water	Droughty, fast intake.	Soil blowing, too sandy.	Droughty.
UgrA:							
Urban land.							
Rensselaer	Severe: seepage.	Severe: piping, ponding.	Severe: no water.	Frost action, ponding.	Droughty, ponding, soil blowing.	Ponding, soil blowing.	Droughty, rooting depth, wetness.
UgsB:							
Urban land.							
Riddles	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Slope, soil blowing.	Soil blowing	Favorable.
Oshtemo	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Fast intake, slope, soil blowing.	Soil blowing, too sandy.	Favorable.
UgvA:							
Urban land.							
Tyner	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake.	Soil blowing, too sandy.	Droughty.
UgvB:							
Urban land.							
Tyner	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Soil blowing, too sandy.	Droughty.
UgwA:							
Urban land.							
Vistula	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Favorable	Favorable	Favorable.

Table 17.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
UhbA:							
Urban land.							
Volinia	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty	Too sandy	Droughty.
Usl:							
Udorthents, rubbish.							
VnxA:							
Vistula	Severe: seepage.	Severe: piping, seepage.	Severe: cutbanks cave.	Deep to water	Droughty, fast intake, soil blowing.	Soil blowing, too sandy.	Droughty.
VolA:							
Volinia	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty	Too sandy	Droughty.
WcnAI:							
Waterford	Severe: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Flooding, frost action.	Droughty, flooding, wetness.	Erodes easily, wetness.	Droughty, erodes easily, wetness.
WoaA:							
Williamstown	Slight	Severe: thin layer.	Severe: no water.	Percs slowly	Percs slowly, wetness.	Erodes easily, wetness.	Erodes easily, rooting depth.
WobB:							
Williamstown	Moderate: slope.	Severe: thin layer.	Severe: no water.	Percs slowly, slope.	Percs slowly, slope, wetness.	Erodes easily, wetness.	Erodes easily, rooting depth.
Crosier	Moderate: seepage.	Severe: piping, wetness.	Severe: no water.	Frost action, percs slowly.	Droughty, wetness.	Erodes easily, wetness.	Droughty, erodes easily, wetness.
WocC2:							
Williamstown	Moderate: slope.	Severe: thin layer.	Severe: no water.	Percs slowly, slope.	Percs slowly, slope, wetness.	Erodes easily, wetness.	Erodes easily, rooting depth.

Table 17.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
WodC3:							
Williamstown-------	Moderate: slope.	Severe: thin layer.	Severe: no water.	Percs slowly, slope.	Percs slowly, slope, wetness.	Erodes easily, wetness.	Erodes easily, rooting depth.
WrxAN:							
Wunabuna-----------	Severe: seepage.	Severe: excess humus, ponding.	Moderate: slow refill.	Frost action, ponding.	Erodes easily, ponding.	Erodes easily, ponding.	Erodes easily, wetness.

Table 18.--Engineering Index Properties

(Absence of an entry indicates that data were not estimated)

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
AahAK:												
Abscota	0-5	Loamy sand	SM	A-2-4	0	0	95-100	95-100	50-75	15-30	0-0	NP
	5-14	Sand, loamy fine sand, loamy sand.	SM	A-1, A-2-4, A-3	0	0	95-100	85-100	45-65	5-30	0-0	NP
	14-60	Sand, coarse sand, gravelly sand.	SM, SP, SP-SM	A-2-4, A-1, A-3	0	0	85-100	60-100	35-55	0-15	0-0	NP
AbhAN, AbhAU:												
Adrian	0-34	Muck	PT	A-8	---	---	---	---	---	---	---	---
	34-80	Sand, fine sand, gravelly loamy sand.	SM, SP	A-1, A-2, A-3	0	0	80-100	60-100	30-80	0-35	0-0	NP
BaaA, BaaB:												
Bainter	0-9	Sandy loam	SC, SC-SM, SM	A-2-4, A-4	0	0	95-100	90-100	70-90	25-40	15-25	NP-10
	9-13	Sandy loam	SC, SC-SM, SM	A-2-4, A-4	0	0	95-100	90-100	75-95	20-50	15-25	NP-10
	13-31	Sandy loam, coarse sandy loam.	SC, SM, SC-SM	A-2-4, A-4	0	0	80-100	75-95	30-80	15-40	14-27	NP-13
	31-54	Coarse sandy loam, sandy clay loam, gravelly coarse sandy loam.	GM, SC, SM, SC-SM	A-2-4, A-4	0	0-5	55-95	50-90	25-80	15-50	14-40	NP-18
	54-80	Sand, gravelly coarse sand.	SP-SM, GP, SW, SW-SM	A-1-a, A-1-b	0	0-5	45-90	35-85	15-40	0-10	0-0	NP
BbmA:												
Baugo	0-11	Silt loam	CL, ML	A-4, A-6	0	0	100	95-100	90-100	75-90	23-40	NP-17
	11-29	Silty clay loam, clay loam.	CL, CL-ML	A-4, A-7-6, A-6	0	0	95-100	90-100	80-100	55-90	23-50	4-31
	29-36	Silt loam, loam, sandy loam.	ML, SC, CL, SM	A-2-6, A-2-4, A-4, A-6	0	0	95-100	90-100	75-100	25-100	14-40	NP-18
	36-56	Sand, loamy sand, gravelly sand.	SM, SP, SP-SM	A-2-4, A-1-b, A-3	0	0-5	85-100	70-100	30-85	0-25	0-0	NP
	56-80	Loam, fine sandy loam.	CL, CL-ML, SC, ML	A-4, A-6	0-1	0-3	90-100	85-100	65-90	40-70	15-30	NP-15

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
BlaA:												
Blount----------	0-7	Loam-----------	CL	A-4, A-6	0	0-5	95-100	95-100	90-100	80-95	25-40	8-20
	7-23	Silty clay loam, silty clay, clay loam.	CH, CL	A-6, A-7	0-1	0-5	95-100	90-100	80-90	75-85	35-60	15-35
	23-42	Silty clay loam, clay loam.	CH, CL, ML, MH	A-6, A-7	0-1	0-5	95-100	90-100	80-90	70-90	35-55	10-30
	42-80	Silty clay loam, clay loam.	CL	A-6, A-7	0-1	0-10	90-100	90-100	80-100	70-90	30-45	10-25
BlaB:												
Blount----------	0-10	Loam-----------	CL	A-4, A-6	0	0-5	95-100	95-100	90-100	80-95	25-40	8-20
	10-24	Silty clay loam, silty clay, clay loam.	CH, CL	A-6, A-7	0-1	0-5	95-100	90-100	80-90	75-85	35-60	15-35
	24-40	Silty clay loam, clay loam.	CH, CL, ML, MH	A-6, A-7	0-1	0-5	95-100	90-100	80-90	70-90	35-55	10-30
	40-80	Silty clay loam, clay loam.	CL	A-6, A-7	0-1	0-10	90-100	90-100	80-100	70-90	30-45	10-25
BshA:												
Brady-----------	0-9	Sandy loam-----	CL-ML, ML, SM, SC-SM	A-1, A-4, A-2	0	0-5	95-100	75-100	45-85	20-55	0-25	NP-7
	9-37	Sandy loam, sandy clay loam, gravelly sandy loam.	ML, CL, SC, SM	A-2, A-1, A-4, A-6	0	0-5	85-100	60-100	35-90	20-55	15-35	NP-15
	37-56	Loamy sand, sandy loam.	SC-SM, SM, SC, SP-SM	A-1, A-2, A-4	0	0-5	95-100	75-100	35-70	10-40	0-30	NP-10
	56-60	Gravelly sand, coarse sand, gravel.	GP-GM, SP, GP, SP-SM	A-1, A-3, A-2-4	0	0-5	40-95	30-85	20-60	0-10	0-14	NP
BteA, BteB:												
Brems-----------	0-9	Loamy sand-----	SM, SP-SM	A-2-4	0	0	100	85-100	60-100	10-35	0-0	NP
	9-72	Sand, fine sand, loamy sand.	SM, SP-SM, SP	A-2-4, A-3	0	0	100	85-100	55-95	0-25	0-0	NP
	72-80	Sand, fine sand, loamy sand.	SP, SM, SP-SM	A-2-4, A-3	0	0	100	85-100	55-95	0-25	0-0	NP

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
BtxA, BtxB, BtxC, BtxD2, BtxE:												
Bristol--------	0-10	Loamy sand-----	SM, SP-SM	A-2-4	0	0	85-100	75-100	55-85	10-25	0-0	NP
	10-21	Loamy sand-----	SM, SP-SM	A-2-4	0	0	85-100	75-100	55-85	10-25	0-0	NP
	21-35	Loamy coarse sand, gravelly sand.	SM, SP, SP-SM	A-1-b, A-2-4, A-3	0	0	75-100	60-100	40-85	0-25	0-0	NP
	35-55	Sand, gravelly loamy coarse sand.	SM, SP, SC, SP-SM	A-1-b, A-2-4, A-3	0	0-5	75-100	60-100	40-85	0-25	0-0	NP
	55-80	Sand, gravelly loamy sand.	SP-SM, SW, SW-SM	A-2-4, A-1-b, A-3	0	0-5	70-100	55-100	40-85	0-25	0-0	NP
BufA:												
Bronson---------	0-8	Sandy loam-----	SC-SM, SM	A-2, A-4	0	0-5	95-100	90-100	55-70	25-40	0-25	NP-7
	8-18	Sandy loam-----	SC-SM, SM	A-2, A-4	0	0-5	95-100	90-100	55-70	25-40	0-25	NP-7
	18-61	Sandy loam, sandy clay loam, gravelly sandy loam.	SC, SC-SM	A-1, A-2, A-6, A-4	0	0-5	80-95	60-90	35-85	20-50	20-30	4-11
	61-80	Sand, gravelly sand, very gravelly sand.	GP-GM, SP, GP, SP-SM	A-1, A-2, A-3	0	0-10	40-90	35-85	20-60	0-10	0-14	NP
BuuA:												
Brookston-------	0-9	Loam-----------	CL-ML, CL, ML	A-4, A-6	0	0	95-100	90-100	85-95	55-75	20-40	NP-17
	9-48	Clay loam, silty clay loam, loam.	CL	A-6, A-7-6	0	0	98-100	85-100	75-100	55-90	25-50	12-33
	48-68	Loam, fine sandy loam.	CL-ML, ML, CL, SC	A-4, A-6	0-1	0-3	90-100	85-100	65-95	40-70	15-40	NP-22
	68-80	Loam, fine sandy loam.	CL-ML, ML, CL, SM	A-4, A-6	0-1	0-3	90-100	85-100	65-90	40-70	15-30	NP-15
CnbA, CnbB, CnbC:												
Coloma----------	0-12	Sand-----------	SM, SP, SP-SM	A-2, A-3	0-1	0-7	75-100	75-100	50-70	2-15	0-14	NP
	12-47	Sand, loamy sand.	SM, SP, SP-SM	A-2, A-3	0-1	0-7	75-100	75-100	50-75	2-30	0-14	NP
	47-80	Stratified sand to sandy loam.	SM, SP, SP-SM	A-3, A-2, A-4	0-1	0-7	75-100	75-100	50-100	2-40	0-14	NP

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
CosA, CosB:												
Cosperville-----	0-9	Loam-----------	CL, CL-ML, ML	A-4	0	0-1	90-100	85-100	75-95	55-70	20-30	NP-10
	9-38	Clay loam, silty clay loam, silty clay.	CH, CL	A-6, A-7-6	0	0-1	90-100	85-100	80-100	70-90	32-54	11-33
	38-48	Clay loam, silty clay loam.	CH, CL	A-6, A-7-6	0	0-1	90-100	85-100	80-95	70-85	32-54	11-33
	48-64	Clay loam, loam.	CL, CL-ML, ML	A-4, A-6, A-7-6	0-1	0-1	90-100	85-100	75-95	50-85	19-45	NP-26
	64-76	Clay loam, loam.	CL, ML, CL-ML	A-6, A-4, A-7-6	0-1	0-1	90-100	85-100	75-95	50-85	15-41	NP-26
	76-84	Sand, fine sand, gravelly sand.	SM, SP-SM, SP	A-2-4, A-3	0	0-1	85-100	70-100	50-95	0-15	0-0	NP
CvdA, CvdB:												
Crosier---------	0-11	Loam-----------	CL, ML, CL-ML	A-4, A-6	0-1	0-1	95-100	90-100	85-95	55-90	20-40	NP-17
	11-30	Clay loam, loam, sandy clay loam.	CL, SC	A-6, A-7-6	0-1	0-1	95-100	90-100	75-95	45-80	25-50	12-30
	30-38	Loam, sandy loam, fine sandy loam.	CL, CL-ML, SC, ML	A-4, A-6	0-1	0-3	90-100	85-100	65-95	40-70	15-40	NP-22
	38-60	Loam, sandy loam, fine sandy loam.	CL, SC, CL-ML, ML	A-4, A-6	0-1	0-3	90-100	85-100	65-90	40-70	15-30	NP-15
DcrA:												
Del Rey---------	0-9	Silty clay loam	CL	A-6, A-7	0	0	95-100	95-100	90-100	70-95	30-45	10-25
	9-33	Silty clay loam, silty clay.	CH, CL	A-7	0	0	95-100	95-100	90-100	85-95	40-55	20-30
	33-90	Silt loam, silty clay loam.	CL	A-6, A-7	0	0	95-100	95-100	90-100	70-95	30-45	10-25

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
DdeA, DdeB:												
Desker----------	0-9	Sandy loam-----	SC, SC-SM, SM	A-2-4, A-4	0	0-5	80-100	75-95	60-80	25-40	15-25	NP-10
	9-25	Gravelly sandy loam, gravelly coarse sandy loam.	SC, SC-SM, SP-SM, SM	A-1-b, A-2-4	0	0-5	55-90	50-75	25-55	10-25	17-27	NP-10
	25-34	Gravelly loamy coarse sand.	SM, SP, SP-SM	A-1, A-1-b	0	0-5	65-85	50-75	25-50	0-15	0-0	NP
	34-60	Stratified very gravelly coarse sand to sand.	SP, SW-SM, SP-SM, SW	A-1-a, A-1-b	0-3	0-5	50-85	35-75	15-40	0-10	0-0	NP
EchAN, EchAU:												
Edwards---------	0-32	Muck-----------	PT	A-8	0	0	---	---	---	---	---	---
	32-80	Marly material	---	---	0	0	---	---	---	---	---	---
GczA:												
Gilford---------	0-14	Sandy loam-----	SC, SC-SM, SM	A-2-4, A-4	0	0	95-100	95-100	55-85	25-45	10-25	2-10
	14-32	Sandy loam, fine sandy loam.	SC, SC-SM, SM	A-2-4, A-4	0	0	95-100	85-95	55-85	25-40	10-25	3-10
	32-48	Loamy sand, sand, loamy fine sand.	SM, SP-SM, SP	A-1-b, A-2-4, A-3	0	0	95-100	85-95	45-90	4-15	0-10	NP
	48-60	Coarse sand, loamy sand, fine sand.	SP, SM, SP-SM	A-1-b, A-3, A-2-4	0	0	95-100	85-95	5-75	0-15	0-10	NP
GdnA:												
Gilford---------	0-14	Mucky sandy loam.	SC, SC-SM, CL-ML, CL	A-4, A-6, A-7, A-2	0	0	95-100	95-100	55-85	25-45	10-25	2-10
	14-32	Sandy loam, fine sandy loam.	SC, SC-SM, SM	A-2-4, A-4	0	0	95-100	85-95	55-85	25-40	10-25	3-10
	32-48	Loamy sand, sand, loamy fine sand.	SM, SP, SP-SM	A-2-4, A-1-b, A-3	0	0	95-100	85-95	45-90	4-15	0-10	NP
	48-60	Coarse sand, loamy sand, fine sand.	SM, SP, SP-SM	A-2-4, A-1-b, A-3	0	0	95-100	85-95	5-75	0-15	0-10	NP

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
GlaB, GlaC:												
Glynwood--------	0-9	Loam-----------	CL, CL-ML	A-4, A-6	0	0	95-100	90-100	80-100	55-90	23-40	4-15
	9-23	Clay, clay loam, silty clay loam.	CH, CL	A-6, A-7	---	0-5	95-100	85-100	75-100	65-95	35-55	15-30
	23-60	Clay loam, silty clay loam.	CL	A-4, A-6	---	0-5	95-100	80-100	75-95	65-90	25-40	7-18
GndA:												
Granby----------	0-10	Loamy sand-----	SM	A-2	0	0	100	100	50-75	15-30	0-14	NP
	10-32	Sand, fine sand, loamy sand.	SM, SP, SP-SM	A-2, A-3	0	0	100	95-100	50-75	0-20	0-14	NP
	32-60	Sand, fine sand.	SP, SP-SM	A-2, A-3	0	0	100	95-100	50-70	0-5	0-14	NP
GocAK, GodAI:												
Gravelton-------	0-11	Loam-----------	CL, ML, CL-ML	A-4, A-6	0	0	95-100	90-100	80-100	50-80	20-35	NP-15
	11-16	Sandy loam, loam.	CL-ML, SC, CL, SC-SM	A-2-4, A-6, A-4	0	0	90-100	85-100	70-100	25-80	14-35	NP-15
	16-48	Gravelly sand, gravelly coarse sand, sand.	SM, SP, SP-SM	A-2-4, A-1-b, A-3	0-1	0-3	65-100	50-100	15-80	0-15	0-0	NP
	48-80	Very gravelly coarse sand, gravelly coarse sand.	SP, SW-SM, SP-SM, SW	A-1-a, A-1-b	0-1	0-3	45-85	35-75	10-40	0-10	0-0	NP
HhaAP:												
Histosols-------	0-40	Muck-----------	PT	A-8	0	0	---	---	---	---	---	NP
	40-60	Fine sand, sand.	SM, SP-SM	A-2, A-3	0	0	100	100	50-90	5-30	---	NP
HtbAN, HtbAU:												
Houghton--------	0-80	Muck-----------	PT	A-8	0	0	---	---	---	---	---	---

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
JaaAK:												
Jamestown-------	0-11	Silt loam------	CL, ML	A-4, A-6	0	0	100	100	95-100	75-100	26-39	2-15
	11-33	Loam, silt loam, silty clay loam.	CL, CL-ML, ML	A-4, A-7-6, A-6, A-7-5	0	0	100	100	90-100	55-100	22-46	NP-24
	33-44	Sandy loam-----	SC, SM, SC-SM	A-2-4, A-4	0	0	90-100	85-100	60-100	25-45	17-27	NP-10
	44-52	Loamy sand, sand, fine sandy loam.	SM, SP-SM	A-2-4, A-4, A-3	0	0	90-100	85-100	55-100	5-45	0-0	NP
	52-80	Loam, fine sandy loam.	CL-ML, ML, CL, SC	A-4, A-6	0-1	0-3	90-100	85-100	65-90	40-70	15-30	NP-15
KimA:												
Kimmell---------	0-8	Loam-----------	CL, CL-ML, ML	A-4	0	0-1	95-100	90-100	85-95	55-70	20-30	NP-10
	8-12	Loam-----------	CL, ML, CL-ML	A-4	0	0-1	95-100	90-100	85-95	55-70	20-30	NP-10
	12-32	Clay loam, silty clay, silty clay loam.	CH, CL	A-6, A-7-6	0	0-1	98-100	90-100	85-100	70-90	32-54	11-33
	32-37	Clay loam, silty clay loam.	CH, CL	A-7-6	0	0-1	95-100	90-100	85-95	70-85	45-55	25-35
	37-75	Clay loam, silty clay loam.	CL	A-6, A-7-6	0	0-1	95-100	90-100	85-95	70-85	30-45	11-26
	75-99	Sand, fine sand, gravelly coarse sand.	SP-SM, SM, SW, SW-SM	A-1-b, A-3, A-2-4	0	0-1	70-100	55-100	20-95	0-15	0-0	NP
MfrAN:												
Madaus----------	0-9	Muck-----------	PT	A-8	0	0	---	---	---	---	0-14	---
	9-48	Marly material	---	---	0	0	---	---	---	---	0-14	---
	48-80	Loamy sand, fine sand, sand.	SM, SP, SP-SM	A-2-4, A-3	0	0	95-100	80-100	50-90	3-20	0-14	NP
MftA:												
Matherton-------	0-9	Loam-----------	CL, CL-ML	A-4, A-6	0	0-5	90-100	75-100	65-95	50-75	20-30	4-11
	9-34	Sandy clay loam, gravelly clay loam, loam.	CL, SC	A-2, A-6, A-7	0	0-5	85-95	60-90	50-90	30-75	30-45	10-25
	34-80	Gravelly sand, sand, very gravelly sand.	GM, SP, GP, SM	A-1, A-3, A-2-4	0	0-10	40-100	25-75	20-55	0-15	0-0	NP

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
MgcA:												
Maumee----------	0-23	Loamy sand-----	SM, SP-SM	A-2-4	0	0	95-100	90-100	60-95	10-25	0-0	NP
	23-38	Sand, loamy fine sand, fine sand.	SM, SP, SP-SM	A-2-4, A-3	0	0	85-100	75-100	50-95	0-25	0-0	NP
	38-60	Sand, coarse sand, loamy fine sand.	SM, SP-SM, SP	A-1-b, A-3, A-2-4	0	0	85-100	75-100	35-95	0-25	0-0	NP
MmdC2:												
Miami-----------	0-8	Loam-----------	CL-ML, CL, ML	A-4, A-6	0	0	95-100	90-100	80-95	60-85	20-37	NP-17
	8-31	Clay loam, silty clay loam.	CL	A-6, A-7-6	0-1	0-3	90-98	85-98	85-95	55-85	30-50	11-31
	31-36	Loam, fine sandy loam.	ML, SC, CL, SM	A-4, A-6	0-1	0-3	90-98	85-98	65-95	40-70	15-37	NP-22
	36-60	Loam, fine sandy loam.	ML, SC, CL, SM	A-4, A-6	0-1	0-3	90-98	85-98	65-90	40-70	15-30	NP-15
MmdC3:												
Miami-----------	0-8	Clay loam------	CL	A-6, A-7-6	0	0	95-100	90-100	85-100	60-100	30-50	12-32
	8-31	Clay loam, silty clay loam.	CL	A-6, A-7-6	0-1	0-3	90-98	85-98	85-95	55-85	30-50	11-31
	31-36	Loam, fine sandy loam.	CL, ML, SM, SC	A-4, A-6	0-1	0-3	90-98	85-98	65-95	40-70	15-37	NP-22
	36-60	Loam, fine sandy loam.	ML, CL, SC, SM	A-4, A-6	0-1	0-3	90-98	85-98	65-90	40-70	15-30	NP-15
MmdD2:												
Miami-----------	0-8	Loam-----------	CL-ML, CL, ML	A-4, A-6	0	0	95-100	90-100	80-95	60-85	20-37	NP-17
	8-31	Clay loam, silty clay loam.	CL	A-6, A-7-6	0-1	0-3	90-98	85-98	85-95	55-85	30-50	11-31
	31-36	Loam, fine sandy loam.	ML, SC, CL, SM	A-4, A-6	0-1	0-3	90-98	85-98	65-95	40-70	15-37	NP-22
	36-60	Loam, fine sandy loam.	ML, SC, CL, SM	A-4, A-6	0-1	0-3	90-98	85-98	65-90	40-70	15-30	NP-15
MmdD3:												
Miami-----------	0-8	Clay loam------	CL	A-6, A-7-6	0	0	95-100	90-100	85-100	60-100	30-50	12-32
	8-31	Clay loam, silty clay loam.	CL	A-6, A-7-6	0-1	0-3	90-98	85-98	85-95	55-85	30-50	11-31
	31-36	Loam, fine sandy loam.	CL, ML, SM, SC	A-4, A-6	0-1	0-3	90-98	85-98	65-95	40-70	15-37	NP-22
	36-60	Loam, fine sandy loam.	ML, CL, SC, SM	A-4, A-6	0-1	0-3	90-98	85-98	65-90	40-70	15-30	NP-15

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	Percentage passing sieve number--: 10	Percentage passing sieve number--: 40	Percentage passing sieve number--: 200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
MouAN:												
Milford---------	0-11	Silty clay loam.	CL, CL-ML	A-4, A-6	0	0	100	95-100	90-100	70-90	25-40	5-20
	11-49	Silty clay, silty clay loam, clay loam.	CH, CL	A-7	0	0	100	95-100	90-100	75-100	40-60	20-40
	49-80	Stratified clay to sandy loam.	CL, SC	A-6, A-7	0	0	95-100	95-100	90-100	45-100	25-50	10-30
MsaA:												
Mishawaka-------	0-12	Sandy loam-----	SC, SC-SM, SM	A-2-4, A-4	0	0	80-100	75-100	60-90	25-40	15-25	NP-10
	12-18	Sandy loam-----	SC, SC-SM, SM	A-2-4, A-4	0	0	80-100	75-100	60-90	25-40	15-25	NP-10
	18-25	Loamy sand, gravelly loamy sand, sandy loam.	GM, SM, SC, SC-SM	A-1-b, A-2-4	0	0	55-100	50-100	40-85	10-25	0-25	NP-10
	25-58	Sand, fine sand.	SM, SP-SM	A-2-4, A-1-b, A-3	0	0	80-100	75-100	30-80	5-35	0-0	NP
	58-80	Sand, coarse sand.	SM, SP-SM	A-2-4, A-1-b, A-3	0	0	80-100	75-100	30-70	0-15	0-0	NP
MvkA:												
Morocco---------	0-9	Loamy sand-----	SM, SP-SM, SP	A-2-4, A-3	0	0	100	98-100	75-95	10-25	0-0	NP
	9-35	Fine sand, sand, loamy fine sand.	SP, SM, SP-SM	A-2-4, A-3	0	0	95-100	90-100	55-95	0-25	0-0	NP
	35-60	Fine sand, sand.	SP, SM, SP-SM	A-2-4, A-3	0	0	95-100	90-100	55-85	0-15	0-0	NP
MwzAN, MwzAU:												
Muskego---------	0-9	Muck-----------	PT	A-8	0	0	---	---	---	---	---	---
	9-27	Muck-----------	PT	A-8	0	0	---	---	---	---	---	---
	27-80	Coprogenous earth.	OL	A-5	0	0	95-100	95-100	85-100	75-96	40-50	2-8
OmgA, OmgB:												
Osolo-----------	0-9	Loamy sand-----	SM, SP-SM	A-2-4	0	0	90-100	85-100	70-90	10-25	0-0	NP
	9-25	Loamy sand-----	SM, SP-SM	A-2-4	0	0	90-100	85-100	70-90	10-25	0-0	NP
	25-66	Sand, fine sand.	SM, SP, SP-SM	A-2-4, A-3	0	0	90-100	85-100	55-95	0-15	0-0	NP
	66-80	Sand, fine sand.	SM, SP, SP-SM	A-2-4, A-3	0	0	90-100	85-100	55-95	0-15	0-0	NP

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
PaaAN:												
Palms-----------	0-35	Muck-----------	PT	---	---	---	---	---	---	---	---	---
	35-80	Clay loam, silty clay loam, fine sandy loam.	CL, CL-ML	A-4, A-6	0	0	85-100	80-100	70-95	50-90	25-40	5-20
PkdA:												
Pewamo----------	0-13	Clay loam------	CL	A-6, A-7	0	0-5	90-100	75-100	75-100	70-90	35-50	15-25
	13-37	Clay loam, clay, silty clay.	CH, CL	A-7	0	0-5	95-100	75-100	75-100	75-95	40-55	20-35
	37-60	Clay loam, silty clay loam.	CL	A-7	0	0-5	95-100	75-100	75-100	70-90	40-50	15-25
Pmg:												
Pits------------	0-60	Very gravelly coarse sand.	SM, GP-GM, SP, SP-SM	A-1, A-3, A-2	---	0-5	45-100	40-100	0-80	0-40	0-14	NP
ReyAN:												
Rensselaer------	0-15	Loam-----------	CL-ML, CL, ML	A-4, A-6	0	0	90-100	90-98	75-85	50-65	20-40	5-20
	15-38	Clay loam, loam.	CL, CL-ML	A-4, A-6	0	0	85-100	75-100	60-95	40-75	20-60	5-30
	38-42	Sandy clay loam, loam.	CL-ML, SC, CL, SC-SM	A-2-4, A-2-6, A-6, A-4	0	0	85-100	75-100	60-95	40-60	20-60	5-20
	42-60	Stratified fine sand to silt loam.	CL-ML, SM, CL, SP-SM	A-2, A-4	0	0	95-100	90-100	55-95	0-85	0-40	NP-15
RopA, RopB:												
Riddles---------	0-8	Sandy loam-----	SM, SC-SM	A-4	0	0-3	85-100	75-100	45-95	35-50	15-30	NP-10
	8-33	Sandy clay loam, loam, fine sandy loam.	CL, SC	A-6	0	0-3	85-100	75-100	45-95	40-70	25-50	7-32
	33-63	Loam, sandy loam, clay loam.	CL-ML, SC, CL, SC-SM	A-4, A-6	0	0-3	85-100	75-100	55-95	40-75	17-50	7-32
	63-90	Sandy loam, gravelly sand.	SC-SM, SM	A-4	0	0-3	85-100	75-100	15-85	0-40	15-25	NP-10
	90-99	Sandy loam, loam.	SC, CL, ML, CL-ML	A-6, A-4	0-1	0-3	90-100	85-100	65-90	40-70	15-30	NP-15

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
RopA, RopB:												
Oshtemo---------	0-15	Loamy sand-----	SM, SP-SM, SP	A-2-4	0-1	0-5	80-100	75-98	55-80	10-25	0-0	NP
	15-32	Gravelly sandy clay loam, loam, gravelly sandy loam.	SC, SC-SM, CL, SM	A-2-4, A-4, A-6	0-2	0-5	80-100	75-95	45-80	20-50	10-50	NP-20
	32-62	Gravelly sandy loam, gravelly loamy sand.	SC-SM, SM, SC, SP	A-2-4, A-3, A-4	0-2	0-10	60-95	50-75	25-55	10-30	0-25	NP-10
	62-80	Stratified sand to gravelly coarse sand.	SP-SM, SW, SW-SM	A-1-b, A-2	0-2	0-20	55-85	40-75	10-50	0-15	0-0	NP
RoqC2, RoqD2:												
Riddles---------	0-8	Sandy loam-----	SM, SC-SM	A-4	0	0-3	85-100	75-100	45-95	35-50	15-30	NP-10
	8-33	Sandy clay loam, loam, fine sandy loam.	CL, SC	A-6	0	0-3	85-100	75-100	45-95	40-70	25-50	7-32
	33-63	Loam, sandy loam, clay loam.	CL, SC-SM, CL-ML, SC	A-4, A-6	0	0-3	85-100	75-100	55-95	40-75	17-50	7-32
	63-90	Sandy loam, gravelly sand.	SC-SM, SM	A-4	0	0-3	85-100	75-100	15-85	0-40	15-25	NP-10
	90-99	Sandy loam, loam.	SC, CL, ML, CL-ML	A-6, A-4	0-1	0-3	90-100	85-100	65-90	40-70	15-30	NP-15
Metea-----------	0-9	Loamy sand-----	SM	A-2-4	0	0	100	100	50-80	15-35	0-14	NP
	9-28	Loamy sand, loamy fine sand, sand.	SM, SP-SM	A-2-4, A-3	0	0	100	100	50-80	5-35	0-14	NP
	28-32	Sandy clay loam, fine sandy loam, sandy loam.	CL-ML, CL, SC, SC-SM	A-2-4, A-4	0	0	95-100	95-100	55-90	15-75	0-27	4-9
	32-44	Loam, clay loam.	CL	A-6	0	0-3	95-100	85-90	75-90	50-80	30-40	10-15
	44-60	Loam-----------	CL, CL-ML	A-4	0	0-3	85-95	75-95	65-90	50-75	0-25	5-10

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
RosE:												
Riddles----------	0-8	Sandy loam-----	SM, SC-SM	A-4	0	0-3	85-100	75-100	45-95	35-50	15-30	NP-10
	8-33	Sandy clay loam, loam, fine sandy loam.	CL, SC	A-6	0	0-3	85-100	75-100	45-95	40-70	25-50	7-32
	33-63	Loam, sandy loam, clay loam.	CL-ML, CL, SC, SC-SM	A-4, A-6	0	0-3	85-100	75-100	55-95	40-75	17-50	7-32
	63-90	Sandy loam, gravelly sand.	SC-SM, SM	A-4	0	0-3	85-100	75-100	15-85	0-40	15-25	NP-10
	90-99	Sandy loam, loam.	SC, ML, CL, CL-ML	A-6, A-4	0-1	0-3	90-100	85-100	65-90	40-70	15-30	NP-15
Tyner-----------	0-12	Loamy sand-----	SM, SP-SM	A-2-4	0	0	90-100	85-100	55-85	10-25	0-0	NP
	12-20	Loamy sand, loamy fine sand.	SM, SP-SM	A-2-4	0	0	90-100	85-100	55-95	10-25	0-0	NP
	20-41	Sand, fine sand, loamy sand.	SM, SP, SP-SM	A-2-4, A-3	0	0	90-100	85-100	55-85	0-25	0-0	NP
	41-80	Sand, coarse sand, fine sand.	SM, SP-SM, SP	A-2-4, A-1-b, A-3	0	0	90-100	85-100	35-95	0-15	0-0	NP
ScuA:												
Sebewa----------	0-14	Loam-----------	CL, CL-ML	A-4, A-6	0	0	95-100	75-100	65-95	50-75	20-35	4-15
	14-36	Sandy clay loam, loam, gravelly clay loam.	CL, SC	A-2, A-7, A-6	0	0	95-100	60-90	50-90	25-75	25-45	10-25
	36-60	Gravelly sand, very gravelly coarse sand, sand.	GP, SP-SM, GP-GM, SP	A-1, A-2, A-3	---	0-5	40-95	25-90	20-60	0-10	0-14	NP
SdnA:												
Sebewa----------	0-14	Mucky loam-----	CL, CL-ML	A-4, A-6	0	0	95-100	75-100	65-95	50-75	20-35	4-15
	14-36	Sandy clay loam, loam, gravelly clay loam.	CL, SC	A-2, A-7, A-6	0	0	95-100	60-90	50-90	25-75	25-45	10-25
	36-60	Gravelly sand, very gravelly coarse sand, sand.	GP, GP-GM, SP-SM, SP	A-1, A-3, A-2	---	0-5	40-95	25-90	20-60	0-10	0-14	NP

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
SdzA:												
Selfridge-------	0-11	Loamy sand-----	SC-SM, SM, SP-SM	A-1, A-2	0	0-5	95-100	90-100	45-80	10-35	0-20	NP-5
	11-27	Sand, loamy sand, loamy fine sand.	SC-SM, SP-SM, SM	A-1, A-3, A-2	0	0-5	95-100	90-100	45-80	5-35	0-20	NP-5
	27-36	Sandy loam, sandy clay loam, loam.	ML, CL, SC, SM	A-2, A-6, A-4	0	0-5	95-100	85-100	50-95	25-75	15-35	NP-15
	36-80	Clay loam, loam, silty clay loam.	CL	A-6, A-7	0	0-5	95-100	85-100	70-100	50-95	25-45	10-20
Crosier---------	0-11	Loam-----------	CL-ML, CL, ML	A-4, A-6	0-1	0-1	95-100	90-100	85-95	55-90	20-40	NP-17
	11-30	Clay loam, loam, sandy clay loam.	CL, SC	A-6, A-7-6	0-1	0-1	95-100	90-100	75-95	45-80	25-50	12-30
	30-38	Loam, sandy loam, fine sandy loam.	CL, CL-ML, SC, ML	A-4, A-6	0-1	0-3	90-100	85-100	65-95	40-70	15-40	NP-22
	38-60	Loam, sandy loam, fine sandy loam.	CL-ML, ML, CL, SC	A-4, A-6	0-1	0-3	90-100	85-100	65-90	40-70	15-30	NP-15
SdzaB:												
Selfridge-------	0-11	Loamy sand-----	SC-SM, SM, SP-SM	A-1, A-2	0	0-5	95-100	90-100	45-80	10-35	0-20	NP-5
	11-27	Sand, loamy sand, loamy fine sand.	SC-SM, SP-SM, SM	A-2-4, A-3,	0	0-5	95-100	90-100	45-80	5-35	0-20	NP-5
	27-36	Sandy loam, sandy clay loam, loam.	ML, CL, SC, SM	A-4, A-6 A-2-6, A-2-4	0	0-5	95-100	85-100	50-95	25-75	15-35	NP-15
	36-80	Clay loam, loam, silty clay loam.	CL	A-6, A-7	0	0-5	95-100	85-100	70-100	50-95	25-45	10-20
Brems-----------	0-9	Loamy sand-----	SM, SP-SM	A-2-4	0	0	100	85-100	60-100	10-35	0-0	NP
	9-72	Sand, fine sand, loamy sand.	SM, SP, SP-SM	A-2-4, A-3	0	0	100	85-100	55-95	0-25	0-0	NP
	72-80	Sand, fine sand, loamy sand.	SM, SP-SM, SP	A-2-4, A-3	0	0	100	85-100	55-95	0-25	0-0	NP

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct	Pct					Pct	
SnlA:												
Southwest-------	0-10	Silt loam------	CL, ML	A-4, A-6	0	0	100	100	95-100	75-100	27-39	3-15
	10-23	Silt loam------	CL, ML	A-4, A-6	0	0	100	100	95-100	75-100	27-39	3-15
	23-34	Silt loam, silty clay loam, loam.	CL, ML	A-6	0	0	95-100	90-100	85-100	50-100	20-40	10-20
	34-45	Silt loam, silty clay loam, loam.	CL, CL-ML, ML	A-4, A-7-6, A-6	0	0	95-100	90-100	85-100	50-100	20-50	3-33
	45-75	Silty clay loam, silt loam.	CL, CL-ML, ML	A-4, A-6, A-7-6	0	0	95-100	90-100	85-100	65-100	25-50	3-28
	75-80	Loam, silt loam, clay loam.	CL, CL-ML, ML	A-6, A-4, A-7-6	0	0-1	95-100	90-100	75-100	50-100	20-44	NP-24
TxuA, TxuB, TxuC, TxuD, TxuF:												
Tyner----------	0-12	Loamy sand-----	SM, SP-SM	A-2-4	0	0	90-100	85-100	55-85	10-25	0-0	NP
	12-20	Loamy sand, loamy fine sand.	SM, SP-SM	A-2-4	0	0	90-100	85-100	55-95	10-25	0-0	NP
	20-41	Sand, fine sand, loamy sand.	SM, SP-SM, SP	A-2-4, A-3	0	0	90-100	85-100	55-85	0-25	0-0	NP
	41-80	Sand, coarse sand, fine sand.	SP, SM, SP-SM	A-2-4, A-1-b, A-3	0	0	90-100	85-100	35-95	0-15	0-0	NP
Uam:												
Udorthents, loamy----------	0-60	Loam-----------	CL	A-4, A-6	0	0-3	85-100	80-100	70-100	55-95	25-40	8-15
Uaz:												
Psamments-------	0-60	Sand-----------	SM, SP, SP-SM	A-1, A-3, A-2	0	0	75-100	70-100	35-75	3-35	0-14	NP
Uba:												
Psammaquents----	0-60	Sand-----------	SP, SM, SP-SM	A-2, A-1, A-3	0	0	75-100	70-100	35-75	3-35	0-14	NP

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
UdeA:												
Urban land.												
Bainter	0-9	Sandy loam	SC-SM, SC, SM	A-2-4, A-4	0	0	95-100	90-100	70-90	25-40	15-25	NP-10
	9-13	Sandy loam	SC, SC-SM, SM	A-2-4, A-4	0	0	95-100	90-100	75-95	20-50	15-25	NP-10
	13-31	Sandy loam, coarse sandy loam.	SC, SM, SC-SM	A-2-4, A-4	0	0	80-100	75-95	30-80	15-40	14-27	NP-13
	31-54	Coarse sandy loam, sandy clay loam, gravelly coarse sandy loam.	SC, SC-SM, GM, SM	A-2-4, A-4	0	0-5	55-95	50-90	25-80	15-50	14-40	NP-18
	54-80	Sand, gravelly coarse sand.	SP-SM, GP, SW, SW-SM	A-1-a, A-1-b, A-3	0	0-5	45-90	35-85	15-40	0-10	0-0	NP
UdkA:												
Urban land.												
Brady	0-9	Sandy loam	CL-ML, SM, ML, SC-SM	A-2, A-1, A-4	0	0-5	95-100	75-100	45-85	20-55	0-25	NP-7
	9-37	Sandy loam, sandy clay loam, gravelly sandy loam.	CL, SM, ML, SC	A-2, A-1, A-4, A-6	0	0-5	85-100	60-100	35-90	20-55	15-35	NP-15
	37-56	Loamy sand, sandy loam.	SC-SM, SC, SM, SP-SM	A-2, A-1, A-4	0	0-5	95-100	75-100	35-70	10-40	0-30	NP-10
	56-60	Gravelly sand, coarse sand, gravel.	GP-GM, SP, GP, SP-SM	A-1, A-2-4, A-3	0	0-5	40-95	30-85	20-60	0-10	0-14	NP
UdoA:												
Urban land.												
Brems	0-9	Loamy sand	SM, SP-SM	A-2-4	0	0	100	85-100	60-100	10-35	0-0	NP
	9-72	Sand, fine sand, loamy sand.	SM, SP-SM, SP	A-2-4, A-3	0	0	100	85-100	55-95	0-25	0-0	NP
	72-80	Sand, fine sand, loamy sand.	SP, SM, SP-SM	A-2-4, A-3	0	0	100	85-100	55-95	0-25	0-0	NP

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
UdpA, UdpB:												
Urban land.												
Bristol---------	0-10	Loamy sand-----	SM, SP-SM	A-2-4	0	0	85-100	75-100	55-85	10-25	0-0	NP
	10-21	Loamy sand-----	SM, SP-SM	A-2-4	0	0	85-100	75-100	55-85	10-25	0-0	NP
	21-35	Loamy sand, loamy coarse sand, sand, gravelly loamy sand.	SM, SP, SP-SM	A-1-b, A-3, A-2-4	0	0	75-100	60-100	40-85	0-25	0-0	NP
	35-55	Loamy sand, loamy coarse sand, sand, gravelly loamy sand.	SC, SM, SP-SM, SP	A-1-b, A-2-4, A-3	0	0-5	75-100	60-100	40-85	0-25	0-0	NP
	55-80	Sand, loamy sand, gravelly loamy sand.	SP-SM, SW, SW-SM	A-1-b, A-2-4, A-3	0	0-5	70-100	55-100	40-85	0-25	0-0	NP
UdrA:												
Urban land.												
Bronson---------	0-8	Sandy loam-----	SC-SM, SM	A-2, A-4	0	0-5	95-100	90-100	55-70	25-40	0-25	NP-7
	8-18	Sandy loam-----	SC-SM, SM	A-2, A-4	0	0-5	95-100	90-100	55-70	25-40	0-25	NP-7
	18-61	Sandy loam, sandy clay loam, gravelly sandy loam.	SC, SC-SM	A-1, A-2, A-6, A-4	0	0-5	80-95	60-90	35-85	20-50	20-30	4-11
	61-80	Sand, gravelly sand, very gravelly sand.	GP-GM, SP, GP, SP-SM	A-2, A-1, A-3	0	0-10	40-90	35-85	20-60	0-10	0-14	NP
UeaA:												
Urban land.												
Crosier---------	0-11	Loam----------	CL, ML, CL-ML	A-4, A-6	0-1	0-1	95-100	90-100	85-95	55-90	20-40	NP-17
	11-30	Clay loam, loam, sandy clay loam.	CL, SC	A-6, A-7-6	0-1	0-1	95-100	90-100	75-95	45-80	25-50	12-30
	30-38	Loam, sandy loam, fine sandy loam.	CL-ML, CL, ML, SC	A-4, A-6	0-1	0-3	90-100	85-100	65-95	40-70	15-40	NP-22
	38-60	Loam, sandy loam, fine sandy loam.	CL, SC, CL-ML, ML	A-4, A-6	0-1	0-3	90-100	85-100	65-90	40-70	15-30	NP-15

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
UeqA:												
Urban land.												
Gilford---------	0-14	Sandy loam-----	SC, SM, SC-SM	A-2-4, A-4	0	0	95-100	95-100	55-85	25-45	10-25	2-10
	14-32	Sandy loam, fine sandy loam.	SC, SC-SM, SM	A-2-4, A-4	0	0	95-100	85-95	55-85	25-40	10-25	3-10
	32-48	Loamy sand, sand, loamy fine sand.	SM, SP-SM, SP	A-1-b, A-2-4, A-3	0	0	95-100	85-95	45-90	4-15	0-10	NP
	48-60	Coarse sand, loamy sand, fine sand.	SM, SP-SM, SP	A-2-4, A-1-b, A-3	0	0	95-100	85-95	5-75	0-15	0-10	NP
UfzA:												
Urban land.												
Mishawaka-------	0-12	Sandy loam-----	SC, SC-SM, SM	A-2-4, A-4	0	0	80-100	75-100	60-90	25-40	15-25	NP-10
	12-18	Sandy loam-----	SC, SC-SM, SM	A-2-4, A-4	0	0	80-100	75-100	60-90	25-40	15-25	NP-10
	18-25	Loamy sand, gravelly loamy sand, sandy loam.	GM, SM, SC, SC-SM	A-1-b, A-2-4	0	0	55-100	50-100	40-85	10-25	0-25	NP-10
	25-58	Sand, fine sand.	SM, SP-SM	A-1-b, A-3, A-2-4	0	0	80-100	75-100	30-80	5-35	0-0	NP
	58-80	Sand, coarse sand.	SM, SP-SM	A-1-b, A-2-4, A-3	0	0	80-100	75-100	30-70	0-15	0-0	NP
UgaA:												
Urban land.												
Morocco---------	0-9	Loamy fine sand.	SP, SM, SP-SM	A-2-4, A-3	0	0	100	98-100	75-95	10-25	0-0	NP
	9-35	Fine sand, sand, loamy fine sand.	SM, SP, SP-SM	A-2-4, A-3	0	0	95-100	90-100	55-95	0-25	0-0	NP
	35-60	Fine sand, sand.	SM, SP-SM, SP	A-2-4, A-3	0	0	95-100	90-100	55-85	0-15	0-0	NP

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
UglA:												
Urban land.												
Osolo----------	0-9	Loamy sand-----	SM, SP-SM	A-2-4	0	0	90-100	85-100	70-90	10-25	0-0	NP
	9-25	Loamy sand-----	SM, SP-SM	A-2-4	0	0	90-100	85-100	70-90	10-25	0-0	NP
	25-66	Sand, fine sand.	SM, SP, SP-SM	A-2-4, A-3	0	0	90-100	85-100	55-95	0-15	0-0	NP
	66-80	Sand, fine sand.	SM, SP-SM, SP	A-2-4, A-3	0	0	90-100	85-100	55-95	0-15	0-0	NP
UgrA:												
Urban land.												
Rensselaer------	0-11	Loam-----------	SC, SC-SM, SM	A-2-4, A-4	0	0	80-100	75-100	60-90	25-40	15-25	NP-10
	11-20	Sandy loam, fine sandy loam, sandy clay loam.	CL-ML, SM, SC, SC-SM	A-2-6, A-2-4, A-4, A-6	0	0	90-100	75-100	45-95	20-55	22-40	NP-18
	20-35	Sandy loam, fine sandy loam.	SC, SM, SC-SM	A-2-4, A-4	0	0	90-100	75-100	55-85	25-50	17-27	NP-10
	35-45	Stratified sandy loam to gravelly loamy coarse sand.	SM, SP-SM	A-2-4, A-1-b, A-3, A-4	0	0-5	60-100	55-100	30-95	5-50	0-0	NP
	45-53	Stratified loamy sand to gravelly sand.	SM, SW, SP-SM	A-1-b, A-2-4, A-3	0	0-5	70-100	55-100	40-85	0-25	0-0	NP
	53-80	Loam, fine sandy loam.	CL, SC, CL-ML, ML	A-4, A-6	0	0-3	90-100	85-98	65-90	40-70	15-30	NP-15
UgsB:												
Urban land.												
Riddles---------	0-8	Sandy loam-----	SM, SC-SM	A-4	0	0-3	85-100	75-100	45-95	35-50	15-30	NP-10
	8-33	Sandy clay loam, loam, fine sandy loam.	CL, SC	A-6	0	0-3	85-100	75-100	45-95	40-70	25-50	7-32
	33-63	Loam, sandy loam, clay loam.	CL-ML, SC, CL, SC-SM	A-4, A-6	0	0-3	85-100	75-100	55-95	40-75	17-50	7-32
	63-90	Sandy loam, gravelly sand.	SC-SM, SM	A-4	0	0-3	85-100	75-100	15-85	0-40	15-25	NP-10
	90-99	Sandy loam, loam.	CL, SC, CL-ML, ML	A-6, A-4	0-1	0-3	90-100	85-100	65-90	40-70	15-30	NP-15

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
UgsB:												
Oshtemo---------	0-15	Fine sandy loam	SP, SM, SP-SM	A-2-4, A-3	0-1	0-5	80-100	75-98	55-80	10-25	0-0	NP
	15-32	Gravelly sandy clay loam, loam, gravelly sandy loam.	SC, CL, SC-SM, SM	A-2-4, A-6, A-4	0-2	0-5	80-100	75-95	45-80	20-50	10-50	NP-20
	32-62	Gravelly sandy loam, gravelly loamy sand.	SC, SP, SC-SM, SM	A-2-4, A-3, A-4	0-2	0-10	60-95	50-75	25-55	10-30	0-25	NP-10
	62-80	Stratified sand to gravelly coarse sand.	SP-SM, SW-SM, SW	A-1-b, A-3, A-2	0-2	0-20	55-85	40-75	10-50	0-15	0-0	NP
UgvA, UgvB:												
Urban land.												
Tyner-----------	0-12	Loamy sand-----	SM, SP-SM	A-2-4	0	0	90-100	85-100	55-85	10-25	0-0	NP
	12-20	Loamy sand, loamy fine sand.	SM, SP-SM	A-2-4	0	0	90-100	85-100	55-95	10-25	0-0	NP
	20-41	Sand, fine sand, loamy sand.	SM, SP, SP-SM	A-2-4, A-3	0	0	90-100	85-100	55-85	0-25	0-0	NP
	41-80	Sand, coarse sand, fine sand.	SM, SP-SM, SP	A-2-4, A-1-b, A-3	0	0	90-100	85-100	35-95	0-15	0-0	NP
UgwA:												
Urban land.												
Vistula---------	0-10	Loamy sand-----	SM, SP-SM	A-2-4	0	0	85-100	75-100	55-85	10-25	0-0	NP
	10-21	Loamy sand-----	SM, SP-SM	A-2-4	0	0	85-100	75-100	55-85	10-25	0-0	NP
	21-35	Loamy coarse sand.	SM, SP-SM, SP	A-1-b, A-2-4, A-3	0	0	75-100	60-100	40-85	0-25	0-0	NP
	35-55	Sand-----------	SM, SC, SP, SP-SM	A-2-4, A-1-b, A-3	0	0-5	75-100	60-100	40-85	0-25	0-0	NP
	55-80	Sand-----------	SP-SM, SW-SM, SW	A-2-4, A-1-b, A-3	0	0-5	70-100	55-100	40-85	0-25	0-0	NP

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
UhbA:												
Urban land.												
Volinia---------	0-9	Loam-----------	CL, CL-ML, ML	A-4, A-6	0	0	95-100	90-100	75-100	50-70	21-40	NP-18
	9-23	Clay loam, gravelly sandy clay loam, sandy clay loam.	CL, SC-SM, CL-ML, SC	A-4, A-6, A-2, A-7-6	0	0-1	70-100	55-90	35-85	15-65	22-52	4-31
	23-58	Loamy sand, sand, gravelly loamy coarse sand.	SM, SP-SM	A-1, A-2, A-3	0	0-2	65-100	55-95	15-70	5-20	0-0	NP
	58-80	Stratified sand to very gravelly coarse sand.	SP-SM, SW, SW-SM	A-1-b, A-1-a, A-3	0-2	0-10	50-100	40-85	15-70	0-15	0-0	NP
Usl:												
Udorthents, rubbish.												
VnxA:												
Vistula---------	0-9	Loamy sand-----	SM, SP-SM	A-2-4	0	0-1	85-100	75-100	55-90	10-25	0-0	NP
	9-14	Loamy sand, gravelly loamy sand.	SM, SP-SM	A-1-b, A-2-4	0	0-1	75-100	60-100	45-90	10-25	0-0	NP
	14-45	Loamy sand, gravelly loamy sand.	SM, SP-SM	A-1-b, A-2-4	0	0-1	75-100	60-98	45-85	10-25	0-0	NP
	45-58	Loamy sand, sand, gravelly loamy sand.	SP-SM, SM, SW-SM	A-1-b, A-2-4, A-3	0	0-1	75-100	60-98	45-85	5-25	0-0	NP
	58-75	Gravelly loamy sand, loamy sand.	SM, SP-SM	A-1-b, A-2-4	0	0-5	70-100	60-98	45-85	10-25	0-0	NP
	75-80	Sand, gravelly sand.	SP-SM, SW, SP, SW-SM	A-1-b, A-3, A-2-4	0	0-5	70-100	55-98	40-80	0-15	0-0	NP

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
VolA:												
Volinia---------	0-9	Loam----------	CL, CL-ML, ML	A-4, A-6	0	0	95-100	90-100	75-100	50-70	21-40	NP-18
	9-23	Clay loam, gravelly sandy clay loam, sandy clay loam.	CL, SC-SM, CL-ML, SC	A-4, A-2, A-6, A-7-6	0	0-1	70-100	55-90	35-85	15-65	22-52	4-31
	23-58	Loamy sand, sand, gravelly loamy coarse sand.	SM, SP-SM	A-1, A-2, A-3	0	0-2	65-100	55-95	15-70	5-20	0-0	NP
	58-80	Stratified sand to very gravelly coarse sand.	SW, SP-SM, SW-SM	A-1-b, A-1-a, A-3	0-2	0-10	50-100	40-85	15-70	0-15	0-0	NP
WcnAI:												
Waterford-------	0-8	Loam----------	CL, CL-ML	A-4, A-6	0	0	95-100	90-100	80-100	50-80	20-35	5-15
	8-41	Sandy loam, loam, fine sandy loam.	CL-ML, SC, CL, SC-SM	A-2-4, A-4	0	0	95-100	90-100	75-100	25-80	14-35	NP-10
	41-80	Stratified loamy sand to very gravelly coarse sand.	SP-SM, SW, SM, SW-SM	A-1-b, A-1-a, A-2-4	0	0	60-100	45-100	15-90	0-30	0-0	NP
WoaA:												
Williamstown----	0-9	Loam----------	CL, CL-ML, ML	A-4, A-6	0	0	95-100	85-100	85-100	55-85	15-40	NP-15
	9-33	Clay loam, silty clay loam.	CL	A-6, A-7-6	0	0	90-100	85-100	85-98	55-85	30-50	10-30
	33-37	Loam, fine sandy loam.	ML, CL, SC, SM	A-4, A-6	0	0	90-100	85-98	65-95	40-70	15-40	NP-25
	37-60	Loam, fine sandy loam.	CL, SM, ML, SC	A-4, A-6	0	0-2	90-100	85-98	65-90	40-70	15-35	NP-20
WobB:												
Williamstown----	0-9	Loam----------	CL, ML, CL-ML	A-4, A-6	0	0	95-100	85-100	85-100	55-85	15-40	NP-15
	9-33	Clay loam, silty clay loam.	CL	A-6, A-7-6	0	0	90-100	85-100	85-98	55-85	30-50	10-30
	33-37	Loam, fine sandy loam.	CL, ML, SM, SC	A-4, A-6	0	0	90-100	85-98	65-95	40-70	15-40	NP-25
	37-60	Loam, fine sandy loam.	CL, ML, SM, SC	A-4, A-6	0	0-2	90-100	85-98	65-90	40-70	15-35	NP-20

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments: >10 inches	Fragments: 3-10 inches	Percentage passing sieve number--: 4	Percentage passing sieve number--: 10	Percentage passing sieve number--: 40	Percentage passing sieve number--: 200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
WobB:												
Crosier---------	0-11	Loam-----------	CL-ML, CL, ML	A-4, A-6	0-1	0-1	95-100	90-100	85-95	55-90	20-40	NP-17
	11-30	Clay loam, loam, sandy clay loam.	CL, SC	A-6, A-7-6	0-1	0-1	95-100	90-100	75-95	45-80	25-50	12-30
	30-38	Loam, sandy loam, fine sandy loam.	CL, CL-ML, SC, ML	A-4, A-6	0-1	0-3	90-100	85-100	65-95	40-70	15-40	NP-22
	38-60	Loam, sandy loam, fine sandy loam.	CL-ML, CL, ML, SC	A-4, A-6	0-1	0-3	90-100	85-100	65-90	40-70	15-30	NP-15
WocC2:												
Williamstown----	0-9	Loam-----------	CL-ML, CL, ML	A-4, A-6	0	0	95-100	85-100	85-100	55-85	15-40	NP-15
	9-33	Clay loam, silty clay loam.	CL	A-6, A-7-6	0	0	90-100	85-100	85-98	55-85	30-50	10-30
	33-37	Loam, fine sandy loam.	CL, ML, SM, SC	A-4, A-6	0	0	90-100	85-98	65-95	40-70	15-40	NP-25
	37-60	Loam, fine sandy loam.	ML, CL, SC, SM	A-4, A-6	0	0-2	90-100	85-98	65-90	40-70	15-35	NP-20
WodC3:												
Williamstown----	0-7	Clay loam------	CL	A-6, A-7-6	0	0	90-100	85-100	85-98	55-85	30-50	10-20
	7-34	Clay loam, silty clay loam.	CL	A-6, A-7-6	0	0	90-100	85-100	85-98	55-85	30-50	10-30
	34-56	Loam, fine sandy loam.	CL, ML, SM, SC	A-4, A-6	0	0	90-100	85-98	65-95	40-70	15-40	NP-25
	56-80	Loam, fine sandy loam.	ML, SC, CL, SM	A-4, A-6	0	0-2	90-100	85-98	65-90	40-70	15-35	NP-20
WrxAN:												
Wunabuna--------	0-19	Silt loam------	CL, ML	A-4, A-6	0	0	100	100	95-100	75-100	26-39	2-15
	19-32	Silty clay loam, silt loam.	CL, ML, CL-ML	A-6, A-4, A-7-6	0	0	100	100	95-100	75-100	26-46	4-24
	32-38	Silty clay loam, silt loam.	CL, CL-ML, ML	A-6, A-4, A-7-6	0	0	100	100	95-100	75-100	26-46	4-24
	38-80	Muck-----------	PT	A-8	0	0	---	---	---	---	0-0	NP

Table 19.--Physical Properties of the Soils

(Entries under "Erosion factors-T" apply to the entire profile. Entries under "Wind erodibility group" apply only to the surface layer. Absence of an entry indicates that data were not estimated)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Erosion factors Kw	Kf	T	Wind erodibility group
	In	Pct	g/cc	In/hr	In/in	Pct				
AahAK:										
Abscota	0-5	2-15	1.30-1.60	6.00-20.00	0.10-0.12	0.0-2.9	.15	.15	5	2
	5-14	0-10	1.35-1.60	6.00-20.00	0.05-0.11	0.0-2.9	.17	.17		
	14-60	0-10	1.45-1.60	6.00-20.00	0.05-0.07	0.0-2.9	.15	.15		
AbhAN:										
Adrian	0-34	0-0	0.30-0.55	0.20-6.00	0.35-0.45	---	---	---	2	2
	34-80	2-10	1.40-1.75	6.00-20.00	0.03-0.08	0.0-2.9	.15	.15		
AbhAU:										
Adrian	0-34	0-0	0.30-0.55	0.20-6.00	0.35-0.45	---	---	---	2	2
	34-80	2-10	1.40-1.75	6.00-20.00	0.03-0.08	0.0-2.9	.15	.15		
BaaA, BaaB:										
Bainter	0-9	2-12	1.40-1.70	2.00-6.00	0.08-0.22	0.0-2.9	.17	.20	4	3
	9-13	2-12	1.45-1.70	2.00-6.00	0.07-0.18	0.0-2.9	.17	.20		
	13-31	10-18	1.45-1.70	2.00-6.00	0.07-0.17	0.0-2.9	.10	.10		
	31-54	10-22	1.25-1.70	2.00-6.00	0.05-0.17	0.0-2.9	.05	.10		
	54-80	0-10	1.60-1.80	20.00-20.00	0.02-0.04	0.0-2.9	.02	.02		
BbmA:										
Baugo	0-11	10-20	1.20-1.65	0.60-2.00	0.17-0.26	0.0-2.9	.43	.43	4	5
	11-29	27-35	1.40-1.70	0.60-2.00	0.07-0.21	3.0-5.9	.43	.43		
	29-36	10-27	1.40-1.70	0.60-2.00	0.07-0.18	0.0-2.9	.43	.43		
	36-56	0-10	1.60-1.80	6.00-20.00	0.02-0.04	0.0-2.9	.10	.10		
	56-80	10-20	1.75-2.00	0.06-0.20	0.01-0.03	0.0-2.9	.43	.49		
BlaA:										
Blount	0-7	22-27	1.35-1.55	0.60-2.00	0.20-0.24	0.0-2.9	.37	.37	4	6
	7-23	35-50	1.40-1.70	0.06-0.20	0.12-0.19	3.0-5.9	.43	.43		
	23-42	27-38	1.50-1.70	0.06-0.20	0.12-0.19	3.0-5.9	.43	.43		
	42-80	27-38	1.75-2.00	0.06-0.20	0.07-0.10	3.0-5.9	.43	.43		
BlaB:										
Blount	0-10	22-27	1.35-1.55	0.60-2.00	0.20-0.24	0.0-2.9	.37	.37	4	6
	10-24	35-50	1.40-1.70	0.06-0.20	0.12-0.19	3.0-5.9	.43	.43		
	24-40	27-38	1.50-1.70	0.06-0.20	0.12-0.19	3.0-5.9	.43	.43		
	40-80	27-38	1.75-2.00	0.06-0.20	0.07-0.10	3.0-5.9	.43	.43		
BshA:										
Brady	0-9	2-15	1.35-1.55	2.00-6.00	0.12-0.16	0.0-2.9	.15	.15	4	3
	9-37	5-22	1.35-1.55	2.00-6.00	0.12-0.17	0.0-2.9	.24	.24		
	37-56	5-20	1.35-1.50	2.00-6.00	0.08-0.13	0.0-2.9	.20	.20		
	56-60	0-10	1.40-1.50	20.00-20.00	0.02-0.04	0.0-2.9	.10	---		
BteA, BteB:										
Brems	0-9	3-7	1.50-1.65	6.00-20.00	0.10-0.12	0.0-2.9	.05	.05	5	2
	9-72	1-6	1.60-1.75	6.00-20.00	0.05-0.08	0.0-2.9	.02	.02		
	72-80	1-6	1.60-1.75	6.00-20.00	0.05-0.07	0.0-2.9	.02	.02		
BtxA, BtxB, BtxC, BtxD, BtxE:										
Bristol	0-10	5-10	1.50-1.70	6.00-20.00	0.10-0.12	0.0-2.9	.10	.10	5	2
	10-21	5-10	1.50-1.70	6.00-20.00	0.09-0.11	0.0-2.9	.15	.15		
	21-35	5-10	1.50-1.70	6.00-20.00	0.03-0.11	0.0-2.9	.05	.05		
	35-55	3-10	1.50-1.70	6.00-20.00	0.03-0.11	0.0-2.9	.02	.02		
	55-80	0-10	1.45-1.75	20.00-20.00	0.02-0.04	0.0-2.9	.02	.02		

Table 19.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Erosion factors Kw	Kf	T	Wind erodibility group
	In	Pct	g/cc	In/hr	In/in	Pct				
BufA:										
Bronson----------	0-8	2-15	1.30-1.60	2.00-6.00	0.13-0.15	0.0-2.9	.15	.15	4	3
	8-18	2-15	1.35-1.60	2.00-6.00	0.12-0.14	0.0-2.9	.24	.24		
	18-61	10-20	1.35-1.60	2.00-6.00	0.12-0.18	0.0-2.9	.15	.24		
	61-80	0-5	1.50-1.65	6.00-20.00	0.02-0.04	0.0-2.9	.05	.10		
BuuA:										
Brookston--------	0-9	14-27	1.35-1.50	0.60-2.00	0.21-0.24	0.0-2.9	.24	.24	5	5
	9-48	25-35	1.40-1.60	0.60-2.00	0.15-0.19	3.0-5.9	.20	.24		
	48-68	12-25	1.60-1.75	0.20-0.20	0.07-0.17	0.0-2.9	.28	.32		
	68-80	10-20	1.60-1.75	0.06-0.20	0.01-0.03	0.0-2.9	.43	.49		
CnbA, CnbB, CnbC:										
Coloma-----------	0-12	0-10	1.35-1.65	6.00-20.00	0.05-0.09	0.0-2.9	.05	.05	5	1
	12-47	0-10	1.35-1.65	6.00-20.00	0.05-0.12	0.0-2.9	.15	.15		
	47-80	2-12	1.50-1.65	2.00-20.00	0.03-0.08	0.0-2.9	.15	.15		
CosA, CosB:										
Cosperville------	0-9	10-20	1.20-1.65	0.60-2.00	0.18-0.22	0.0-2.9	.37	.37	5	5
	9-38	35-45	1.40-1.70	0.20-0.60	0.07-0.17	6.0-8.9	.28	.32		
	38-48	27-40	1.40-1.70	0.20-0.60	0.07-0.17	3.0-5.9	.28	.32		
	48-64	20-35	1.40-1.70	0.20-0.60	0.07-0.17	3.0-5.9	.28	.32		
	64-76	15-30	1.60-1.75	0.06-0.20	0.05-0.15	3.0-5.9	.28	.32		
	76-84	0-10	1.60-1.80	6.00-20.00	0.03-0.06	0.0-2.9	.28	.32		
CvdA, CvdB:										
Crosier----------	0-11	5-25	1.20-1.65	0.60-2.00	0.16-0.19	0.0-2.9	.37	.37	4	5
	11-30	20-34	1.40-1.70	0.60-2.00	0.12-0.19	3.0-5.9	.32	.37		
	30-38	12-25	1.60-1.80	0.20-0.60	0.12-0.16	0.0-2.9	.37	.43		
	38-60	10-20	1.75-2.00	0.06-0.20	0.02-0.04	0.0-2.9	.37	.43		
DcrA:										
Del Rey----------	0-9	27-30	1.30-1.50	0.60-2.00	0.22-0.24	0.0-2.9	.43	.43	4	7
	9-33	35-45	1.40-1.65	0.06-0.20	0.12-0.20	3.0-5.9	.43	.43		
	33-90	22-33	1.50-1.75	0.06-0.20	0.09-0.11	3.0-5.9	.43	.43		
DdeA, DdeB:										
Desker-----------	0-9	7-15	1.30-1.40	2.00-6.00	0.12-0.15	0.0-2.9	.15	.20	4	3
	9-25	12-18	1.60-1.70	2.00-6.00	0.09-0.12	0.0-2.9	.05	.10		
	25-34	5-10	1.60-1.70	6.00-20.00	0.06-0.09	0.0-2.9	.05	.10		
	34-60	0-5	1.70-1.75	20.00-20.00	0.02-0.04	0.0-2.9	.02	.02		
EchAN, EchAU:										
Edwards----------	0-32	0-0	0.30-0.55	0.20-6.00	0.35-0.45	---	---	---	1	2
	32-80	3-6	---	0.01-0.06	---	---	---	---		
GczA:										
Gilford----------	0-14	10-20	1.50-1.70	2.00-6.00	0.15-0.21	0.0-2.9	.15	.15	4	3
	14-32	8-17	1.60-1.70	2.00-6.00	0.10-0.18	0.0-2.9	.20	.20		
	32-48	3-12	1.60-1.80	6.00-20.00	0.04-0.11	0.0-2.9	.15	.15		
	48-60	2-10	1.65-1.80	6.00-20.00	0.03-0.11	0.0-2.9	.05	.05		
GdnA:										
Gilford----------	0-14	10-20	1.50-1.70	2.00-6.00	0.15-0.21	0.0-2.9	.10	.10	4	3
	14-32	8-17	1.60-1.70	2.00-6.00	0.10-0.18	0.0-2.9	.20	.20		
	32-48	3-12	1.60-1.80	6.00-20.00	0.04-0.11	0.0-2.9	.15	.15		
	48-60	2-10	1.65-1.80	6.00-20.00	0.03-0.11	0.0-2.9	.05	.05		
GlaB, GlaC:										
Glynwood---------	0-9	16-27	1.25-1.50	0.60-2.00	0.20-0.24	0.0-2.9	.37	.37	4	6
	9-23	35-55	1.45-1.70	0.06-0.20	0.11-0.18	3.0-5.9	.32	.37		
	23-60	27-36	1.75-2.00	0.06-0.20	0.06-0.10	3.0-5.9	.32	.37		

Table 19.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility (Ksat)	Available water capacity	Linear extensi-bility	Erosion factors Kw	Kf	T	Wind erodibility group
	In	Pct	g/cc	In/hr	In/in	Pct				
GndA:										
Granby----------	0-10	2-14	1.20-1.60	6.00-20.00	0.10-0.12	0.0-2.9	.10	.10	5	2
	10-32	0-14	1.45-1.65	6.00-20.00	0.05-0.12	0.0-2.9	.17	.17		
	32-60	0-10	1.45-1.65	6.00-20.00	0.05-0.09	0.0-2.9	.17	.17		
GocAK, GodAI:										
Gravelton-------	0-11	7-18	1.20-1.65	0.60-2.00	0.13-0.18	0.0-2.9	.20	.20	3	2
	11-16	5-18	1.45-1.70	2.00-6.00	0.07-0.18	0.0-2.9	.20	.20		
	16-48	1-10	1.55-1.75	6.00-20.00	0.02-0.04	0.0-2.9	.02	.02		
	48-80	1-5	1.45-1.75	20.00-20.00	0.02-0.04	0.0-2.9	.02	.02		
HhaAP:										
Histosols-------	0-40	---	0.15-0.45	2.00-6.00	0.35-0.45	0.0-2.9	---	---	3	8
	40-60	0-5	1.60-1.80	6.00-20.00	0.06-0.07	0.0-2.9	.15	.15		
HtbAN:										
Houghton--------	0-9	0-0	0.20-0.35	0.20-6.00	0.35-0.45	---	---	---	3	2
	9-80	0-0	0.15-0.25	0.20-6.00	0.35-0.45	---	---	---		
HtbAU:										
Houghton--------	0-80	---	0.15-0.45	0.20-6.00	0.35-0.45	---	---	---	3	2
JaaAK:										
Jamestown-------	0-11	18-27	1.20-1.65	0.60-2.00	0.17-0.26	0.0-2.9	.32	.32	4	5
	11-33	18-33	1.40-1.60	0.60-2.00	0.17-0.22	0.0-2.9	.32	.32		
	33-44	10-20	1.45-1.70	2.00-6.00	0.07-0.14	0.0-2.9	.28	.32		
	44-52	2-10	1.50-1.75	6.00-20.00	0.06-0.16	0.0-2.9	.10	.10		
	52-80	10-20	1.75-2.00	0.01-0.20	0.01-0.03	0.0-2.9	.43	.49		
KimA:										
Kimmell---------	0-8	10-20	1.20-1.65	0.60-2.00	0.13-0.18	0.0-2.9	.37	.37	4	5
	8-12	10-25	1.35-1.65	0.60-2.00	0.13-0.18	0.0-2.9	.32	.32		
	12-32	35-48	1.40-1.65	0.20-0.60	0.07-0.17	3.0-5.9	.32	.32		
	32-37	27-40	1.40-1.70	0.06-0.20	0.07-0.17	3.0-5.9	.32	.32		
	37-75	27-35	1.70-1.90	0.06-0.20	0.01-0.02	3.0-5.9	.28	.32		
	75-99	0-6	1.60-1.80	6.00-20.00	0.02-0.04	0.0-2.9	.10	.10		
MfrAN:										
Madaus----------	0-9	0-0	0.30-0.55	0.60-6.00	0.35-0.45	---	---	---	1	2
	9-48	0-0	---	0.06-0.20	0.00-0.00	0.0-2.9	---	---		
	48-80	2-8	1.60-1.80	2.00-6.00	0.05-0.10	0.0-2.9	.17	.17		
MftA:										
Matherton-------	0-9	10-20	1.30-1.65	2.00-6.00	0.13-0.22	0.0-2.9	.28	.28	4	5
	9-34	20-35	1.40-1.70	0.60-2.00	0.12-0.18	3.0-5.9	.24	.32		
	34-80	0-10	1.80-1.80	20.00-60.00	0.02-0.04	0.0-2.9	.10	.17		
MgcA:										
Maumee----------	0-23	2-10	1.60-1.75	6.00-20.00	0.10-0.12	0.0-2.9	.05	.05	5	2
	23-38	2-10	1.60-1.75	6.00-20.00	0.06-0.11	0.0-2.9	.02	.02		
	38-60	1-10	1.60-1.75	6.00-20.00	0.05-0.07	0.0-2.9	.02	.02		
MmdC2:										
Miami-----------	0-8	6-18	1.20-1.65	0.60-2.00	0.17-0.26	0.0-2.9	.37	.37	4	5
	8-31	27-35	1.40-1.70	0.60-2.00	0.07-0.21	3.0-5.9	.37	.37		
	31-36	15-25	1.60-1.80	0.20-0.60	0.07-0.17	0.0-2.9	.37	.43		
	36-60	10-20	1.75-2.00	0.01-0.20	0.01-0.03	0.0-2.9	.37	.43		

Table 19.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Erosion factors Kw	Kf	T	Wind erodibility group
	In	Pct	g/cc	In/hr	In/in	Pct				
MmdC3:										
Miami-----------	0-8	20-42	1.30-1.70	0.60-2.00	0.17-0.23	3.0-5.9	.32	.32	3	6
	8-31	27-35	1.40-1.70	0.60-2.00	0.07-0.21	3.0-5.9	.37	.37		
	31-36	15-25	1.60-1.80	0.20-0.60	0.07-0.17	0.0-2.9	.37	.43		
	36-60	10-20	1.75-2.00	0.01-0.20	0.01-0.03	0.0-2.9	.37	.43		
MmdD2:										
Miami-----------	0-8	6-18	1.20-1.65	0.60-2.00	0.17-0.26	0.0-2.9	.37	.37	4	5
	8-31	27-35	1.40-1.70	0.60-2.00	0.07-0.21	3.0-5.9	.37	.37		
	31-36	15-25	1.60-1.80	0.20-0.60	0.07-0.17	0.0-2.9	.37	.43		
	36-60	10-20	1.75-2.00	0.01-0.20	0.01-0.03	0.0-2.9	.37	.43		
MmdD3:										
Miami-----------	0-8	20-42	1.30-1.70	0.60-2.00	0.17-0.23	3.0-5.9	.32	.32	3	6
	8-31	27-35	1.40-1.70	0.60-2.00	0.07-0.21	3.0-5.9	.37	.37		
	31-36	15-25	1.60-1.80	0.20-0.60	0.07-0.17	0.0-2.9	.37	.43		
	36-60	10-20	1.75-2.00	0.01-0.20	0.01-0.03	0.0-2.9	.37	.43		
MouAN:										
Milford---------	0-11	27-35	1.10-1.40	0.60-2.00	0.22-0.24	3.0-5.9	.28	.28	5	6
	11-49	35-42	1.40-1.60	0.20-0.60	0.18-0.20	3.0-5.9	.43	.43		
	49-80	20-30	1.40-1.75	0.20-0.60	0.20-0.22	3.0-5.9	.43	.43		
MsaA:										
Mishawaka-------	0-12	5-15	1.40-1.70	2.00-6.00	0.13-0.17	0.0-2.9	.05	.05	3	3
	12-18	5-15	1.40-1.70	2.00-6.00	0.13-0.17	0.0-2.9	.05	.05		
	18-25	5-15	1.45-1.70	6.00-20.00	0.09-0.14	0.0-2.9	.05	.05		
	25-58	0-5	1.50-1.75	6.00-20.00	0.06-0.08	0.0-2.9	.02	.02		
	58-80	0-3	1.60-1.85	6.00-20.00	0.02-0.07	0.0-2.9	.02	.02		
MvkA:										
Morocco---------	0-9	1-6	1.40-1.60	6.00-20.00	0.10-0.12	0.0-2.9	.05	.05	5	2
	9-35	1-6	1.50-1.70	6.00-20.00	0.06-0.11	0.0-2.9	.02	.02		
	35-60	1-6	1.50-1.70	6.00-20.00	0.05-0.07	0.0-2.9	.02	.02		
MwzAN, MwzAU:										
Muskego---------	0-9	0-0	0.10-0.21	0.60-6.00	0.35-0.45	---	---	---	1	2
	9-27	0-0	0.10-0.21	0.60-6.00	0.35-0.45	---	.10	.10		
	27-80	18-35	0.30-1.10	0.06-0.20	0.18-0.24	3.0-5.9	.28	.28		
OmgA, OmgB:										
Osolo-----------	0-9	3-8	1.40-1.60	6.00-20.00	0.10-0.12	0.0-2.9	.05	.05	5	2
	9-25	3-8	1.50-1.60	6.00-20.00	0.09-0.11	0.0-2.9	.15	.15		
	25-66	0-5	1.50-1.70	6.00-20.00	0.06-0.08	0.0-2.9	.02	.02		
	66-80	0-5	1.50-1.70	6.00-20.00	0.05-0.07	0.0-2.9	.02	.02		
PaaAN:										
Palms-----------	0-35	0-0	0.25-0.45	0.20-6.00	0.35-0.45	---	---	---	2	2
	35-80	7-35	1.45-1.75	0.20-2.00	0.14-0.22	0.0-2.9	.37	.37		
PkdA:										
Pewamo----------	0-13	27-40	1.35-1.55	0.60-2.00	0.20-0.23	3.0-5.9	.24	.24	5	7
	13-37	35-50	1.40-1.70	0.20-0.60	0.08-0.16	3.0-5.9	.32	.32		
	37-60	27-38	1.50-1.70	0.20-0.60	0.14-0.18	3.0-5.9	.37	.37		
Pmg:										
Pits------------	0-60	0-8	1.45-1.75	6.00-20.00	0.02-0.09	0.0-2.9	---	---	---	8
ReyAN:										
Rensselaer------	0-15	11-27	1.30-1.60	0.60-2.00	0.18-0.24	0.0-2.9	.24	.24	5	5
	15-38	20-35	1.40-1.60	0.60-2.00	0.15-0.20	3.0-5.9	.24	.24		
	38-42	20-30	1.40-1.60	0.60-2.00	0.15-0.19	3.0-5.9	.20	.20		
	42-60	8-20	1.60-1.75	0.60-2.00	0.10-0.18	0.0-2.9	.37	.37		

Table 19.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Erosion factors Kw	Kf	T	Wind erodibility group
	In	Pct	g/cc	In/hr	In/in	Pct				
RopA, RopB:										
Riddles---------	0-8	4-14	1.35-1.45	2.00-6.00	0.13-0.18	0.0-2.9	.24	.28	5	3
	8-33	18-32	1.40-1.60	0.60-2.00	0.12-0.18	3.0-5.9	.24	.28		
	33-63	0-22	1.40-1.60	0.60-2.00	0.11-0.19	0.0-2.9	.28	.32		
	63-90	0-15	1.45-1.65	0.60-2.00	0.08-0.13	0.0-2.9	.28	.32		
	90-99	10-20	1.50-1.75	0.60-2.00	0.08-0.15	0.0-2.9	.43	.49		
Oshtemo---------	0-15	5-15	1.40-1.70	6.00-20.00	0.06-0.12	0.0-2.9	.17	.17	4	3
	15-32	10-20	1.60-1.80	2.00-6.00	0.10-0.18	0.0-2.9	.20	.20		
	32-62	5-15	1.60-1.80	2.00-6.00	0.08-0.16	0.0-2.9	.05	.10		
	62-80	0-5	1.60-1.80	20.00-20.00	0.02-0.04	0.0-2.9	.02	.10		
RoqC2, RoqD2:										
Riddles---------	0-8	4-14	1.35-1.45	2.00-6.00	0.13-0.18	0.0-2.9	.24	.28	5	3
	8-33	18-32	1.40-1.60	0.60-2.00	0.12-0.18	3.0-5.9	.24	.28		
	33-63	0-22	1.40-1.60	0.60-2.00	0.11-0.19	0.0-2.9	.28	.32		
	63-90	0-15	1.45-1.65	0.60-2.00	0.08-0.13	0.0-2.9	.28	.32		
	90-99	10-20	1.50-1.75	0.60-2.00	0.08-0.15	0.0-2.9	.43	.49		
Metea-----------	0-9	3-8	1.55-1.65	6.00-20.00	0.10-0.12	0.0-2.9	.17	.17	4	2
	9-28	2-10	1.65-1.80	6.00-20.00	0.06-0.11	0.0-2.9	.17	.17		
	28-32	12-22	1.45-1.55	0.60-2.00	0.15-0.19	0.0-2.9	.32	.32		
	32-44	24-35	1.45-1.65	0.60-2.00	0.15-0.19	3.0-5.9	.32	.37		
	44-60	10-24	1.55-1.70	0.60-2.00	0.08-0.13	0.0-2.9	.32	.37		
RosE:										
Riddles---------	0-8	4-14	1.35-1.45	2.00-6.00	0.13-0.18	0.0-2.9	.24	.28	5	5
	8-33	18-32	1.40-1.60	0.60-2.00	0.12-0.18	3.0-5.9	.24	.28		
	33-63	0-22	1.40-1.60	0.60-2.00	0.11-0.19	0.0-2.9	.28	.32		
	63-90	0-15	1.45-1.65	0.60-2.00	0.08-0.13	0.0-2.9	.28	.32		
	90-99	10-20	1.50-1.75	0.60-2.00	0.08-0.15	0.0-2.9	.43	.49		
Tyner-----------	0-12	3-8	1.40-1.55	6.00-20.00	0.10-0.12	0.0-2.9	.10	.10	5	2
	12-20	3-8	1.45-1.60	6.00-20.00	0.09-0.11	0.0-2.9	.10	.10		
	20-41	1-6	1.55-1.70	6.00-20.00	0.06-0.08	0.0-2.9	.05	.05		
	41-80	1-6	1.55-1.70	6.00-20.00	0.05-0.07	0.0-2.9	.02	.02		
ScuA:										
Sebewa----------	0-14	10-25	1.10-1.60	0.60-2.00	0.18-0.25	0.0-2.9	.15	.15	4	5
	14-36	18-35	1.40-1.70	0.60-2.00	0.15-0.19	3.0-5.9	.32	.43		
	36-60	0-3	1.55-1.75	6.00-20.00	0.02-0.04	0.0-2.9	.10	.15		
SdnA:										
Sebewa----------	0-14	10-25	1.10-1.60	0.60-2.00	0.18-0.25	0.0-2.9	.15	.15	4	5
	14-36	18-35	1.40-1.70	0.60-2.00	0.15-0.19	3.0-5.9	.32	.43		
	36-60	0-3	1.55-1.75	6.00-20.00	0.02-0.04	0.0-2.9	.10	.15		
SdzA:										
Selfridge-------	0-11	2-15	1.25-1.40	6.00-20.00	0.10-0.12	0.0-2.9	.17	.17	5	2
	11-27	2-15	1.60-1.75	0.20-0.60	0.07-0.11	0.0-2.9	.17	.17		
	27-36	8-18	1.60-1.75	0.20-0.60	0.15-0.20	0.0-2.9	.28	.28		
	36-80	18-35	1.60-1.75	0.02-0.04	0.08-0.15	0.0-2.9	.37	.37		
Crosier---------	0-11	5-25	1.20-1.65	0.60-2.00	0.16-0.19	0.0-2.9	.37	.37	4	5
	11-30	20-34	1.40-1.70	0.60-2.00	0.12-0.19	3.0-5.9	.32	.37		
	30-38	12-25	1.60-1.80	0.20-0.60	0.12-0.16	0.0-2.9	.37	.43		
	38-60	10-20	1.75-2.00	0.06-0.20	0.02-0.04	0.0-2.9	.37	.43		

Table 19.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Erosion factors Kw	Kf	T	Wind erodibility group
	In	Pct	g/cc	In/hr	In/in	Pct				
SdzaB:										
Selfridge-------	0-11	2-15	1.25-1.40	6.00-20.00	0.10-0.12	0.0-2.9	.17	.17	5	2
	11-27	2-15	1.60-1.75	0.20-0.60	0.07-0.11	0.0-2.9	.17	.17		
	27-36	8-18	1.60-1.75	0.20-0.60	0.12-0.14	0.0-2.9	.28	.28		
	36-80	18-35	1.60-1.75	0.02-0.04	0.08-0.15	0.0-2.9	.37	.37		
Brems-----------	0-9	3-7	1.50-1.65	6.00-20.00	0.10-0.12	0.0-2.9	.05	.05	5	2
	9-72	1-6	1.60-1.75	6.00-20.00	0.05-0.08	0.0-2.9	.02	.02		
	72-80	1-6	1.60-1.75	6.00-20.00	0.05-0.07	0.0-2.9	.02	.02		
SnlA:										
Southwest-------	0-10	18-27	1.20-1.65	0.60-2.00	0.17-0.26	0.0-2.9	.37	.37	5	6
	10-23	15-32	1.40-1.70	0.60-2.00	0.16-0.21	0.0-2.9	.37	.37		
	23-34	15-35	1.40-1.70	0.20-0.60	0.13-0.21	3.0-5.9	.28	.28		
	34-45	18-32	1.40-1.70	0.20-0.60	0.13-0.21	3.0-5.9	.37	.37		
	45-75	18-32	1.40-1.70	0.20-0.60	0.14-0.21	3.0-5.9	.28	.28		
	75-80	15-32	1.40-1.70	0.20-0.60	0.07-0.21	3.0-5.9	.43	.43		
TxuA, TxuB, TxuC, TxuD, TxuF:										
Tyner----------	0-12	3-8	1.40-1.55	6.00-20.00	0.10-0.12	0.0-2.9	.10	.10	5	2
	12-20	3-8	1.45-1.60	6.00-20.00	0.09-0.11	0.0-2.9	.10	.10		
	20-41	1-6	1.55-1.70	6.00-20.00	0.06-0.08	0.0-2.9	.05	.05		
	41-80	1-6	1.55-1.70	6.00-20.00	0.05-0.07	0.0-2.9	.02	.02		
Uam:										
Udorthents, loamy----------	0-60	20-33	1.40-1.60	0.20-0.60	0.05-0.19	3.0-5.9	.37	.43	5	7
Uaz:										
Psamments-------	0-60	1-4	1.55-1.75	6.00-20.00	0.02-0.05	0.0-2.9	---	---	---	---
Uba:										
Psammaquents----	0-60	1-4	1.55-1.75	6.00-20.00	0.02-0.05	0.0-2.9	---	---	---	---
UdeA:										
Urban land.										
Bainter---------	0-9	2-12	1.40-1.70	2.00-6.00	0.08-0.22	0.0-2.9	.17	.20	4	3
	9-13	2-12	1.45-1.70	2.00-6.00	0.07-0.18	0.0-2.9	.17	.20		
	13-31	10-18	1.45-1.70	2.00-6.00	0.07-0.17	0.0-2.9	.10	.10		
	31-54	10-22	1.25-1.70	2.00-6.00	0.05-0.17	0.0-2.9	.05	.10		
	54-80	0-10	1.60-1.80	20.00-20.00	0.02-0.04	0.0-2.9	.02	.02		
UdkA:										
Urban land.										
Brady-----------	0-9	2-15	1.35-1.55	2.00-6.00	0.12-0.16	0.0-2.9	.15	.15	4	3
	9-37	5-22	1.35-1.55	2.00-6.00	0.12-0.17	0.0-2.9	.24	.24		
	37-56	5-20	1.35-1.50	2.00-6.00	0.08-0.13	0.0-2.9	.20	.20		
	56-60	0-5	1.40-1.50	20.00-20.00	0.02-0.04	0.0-2.9	.10	---		
UdoA:										
Urban land.										
Brems-----------	0-9	3-7	1.50-1.65	6.00-20.00	0.10-0.12	0.0-2.9	.05	.05	5	2
	9-72	1-6	1.60-1.75	6.00-20.00	0.05-0.08	0.0-2.9	.02	.02		
	72-80	1-6	1.60-1.75	6.00-20.00	0.05-0.07	0.0-2.9	.02	.02		

Table 19.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Erosion factors Kw	Kf	T	Wind erodibility group
	In	Pct	g/cc	In/hr	In/in	Pct				
UdpA, UdpB:										
Urban land.										
Bristol---------	0-10	5-10	1.50-1.70	6.00-20.00	0.10-0.12	0.0-2.9	.10	.10	5	2
	10-21	5-10	1.50-1.70	6.00-20.00	0.09-0.11	0.0-2.9	.15	.15		
	21-35	5-10	1.50-1.70	6.00-20.00	0.03-0.11	0.0-2.9	.05	.05		
	35-55	3-10	1.50-1.70	6.00-20.00	0.03-0.11	0.0-2.9	.02	.02		
	55-80	0-10	1.70-2.10	20.00-20.00	0.02-0.04	0.0-2.9	.02	.02		
UdrA:										
Urban land.										
Bronson---------	0-8	2-15	1.30-1.60	2.00-6.00	0.13-0.15	0.0-2.9	.15	.15	4	3
	8-18	2-15	1.35-1.60	2.00-6.00	0.12-0.14	0.0-2.9	.24	.24		
	18-61	10-20	1.35-1.60	2.00-6.00	0.12-0.18	0.0-2.9	.15	.24		
	61-80	0-5	1.50-1.65	6.00-20.00	0.02-0.04	0.0-2.9	.05	.10		
UeaA:										
Urban land.										
Crosier---------	0-11	5-25	1.20-1.65	0.60-2.00	0.16-0.19	0.0-2.9	.37	.37	4	5
	11-30	20-34	1.40-1.70	0.60-2.00	0.12-0.19	3.0-5.9	.32	.37		
	30-38	12-25	1.60-1.80	0.20-0.60	0.12-0.16	0.0-2.9	.37	.43		
	38-60	10-20	1.75-2.00	0.06-0.20	0.02-0.04	0.0-2.9	.37	.43		
UeqA:										
Urban land.										
Gilford---------	0-14	10-20	1.50-1.70	2.00-6.00	0.15-0.21	0.0-2.9	.15	.15	4	3
	14-32	8-17	1.60-1.70	2.00-6.00	0.10-0.18	0.0-2.9	.20	.20		
	32-48	3-12	1.60-1.80	6.00-20.00	0.04-0.11	0.0-2.9	.15	.15		
	48-60	2-10	1.65-1.80	6.00-20.00	0.03-0.11	0.0-2.9	.05	.05		
UfzA:										
Urban land.										
Mishawaka-------	0-12	5-15	1.40-1.70	2.00-6.00	0.13-0.17	0.0-2.9	.05	.05	3	3
	12-18	5-15	1.40-1.70	2.00-6.00	0.13-0.17	0.0-2.9	.05	.05		
	18-25	5-15	1.45-1.70	6.00-20.00	0.09-0.14	0.0-2.9	.05	.05		
	25-58	0-5	1.50-1.75	6.00-20.00	0.06-0.08	0.0-2.9	.02	.02		
	58-80	0-3	1.60-1.85	6.00-20.00	0.02-0.07	0.0-2.9	.02	.02		
UgaA:										
Urban land.										
Morocco---------	0-9	1-6	1.40-1.60	6.00-20.00	0.10-0.12	0.0-2.9	.05	.05	5	2
	9-35	1-6	1.50-1.70	6.00-20.00	0.06-0.11	0.0-2.9	.02	.02		
	35-60	1-6	1.50-1.70	6.00-20.00	0.05-0.07	0.0-2.9	.02	.02		
UglA:										
Urban land.										
Osolo-----------	0-9	3-8	1.40-1.60	6.00-20.00	0.10-0.12	0.0-2.9	.05	.05	5	2
	9-25	3-8	1.50-1.60	6.00-20.00	0.09-0.11	0.0-2.9	.15	.15		
	25-66	0-5	1.50-1.70	6.00-20.00	0.06-0.08	0.0-2.9	.02	.02		
	66-80	0-5	1.50-1.70	6.00-20.00	0.05-0.07	0.0-2.9	.02	.02		

Table 19.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Erosion factors Kw	Kf	T	Wind erodibility group
	In	Pct	g/cc	In/hr	In/in	Pct				
UgrA:										
Urban land.										
Rensselaer------	0-11	13-20	1.40-1.70	2.00-6.00	0.07-0.14	0.0-2.9	.24	.24	5	3
	11-20	10-32	1.45-1.70	2.00-6.00	0.07-0.18	0.0-2.9	.24	.28		
	20-35	10-18	1.45-1.70	2.00-6.00	0.07-0.14	0.0-2.9	.24	.24		
	35-45	5-18	1.50-1.75	6.00-20.00	0.07-0.14	0.0-2.9	.15	.20		
	45-53	0-10	1.60-1.85	6.00-20.00	0.03-0.07	0.0-2.9	.15	.17		
	53-80	10-20	1.75-1.95	0.01-0.20	0.01-0.03	0.0-2.9	.43	.49		
UgsB:										
Urban land.										
Riddles---------	0-8	4-14	1.35-1.45	2.00-6.00	0.13-0.18	0.0-2.9	.24	.28	5	3
	8-33	18-32	1.40-1.60	0.60-2.00	0.12-0.18	3.0-5.9	.24	.28		
	33-63	0-22	1.40-1.60	0.60-2.00	0.11-0.19	0.0-2.9	.28	.32		
	63-90	0-15	1.45-1.65	0.60-2.00	0.08-0.13	0.0-2.9	.28	.32		
	90-99	10-20	1.50-1.75	0.60-2.00	0.08-0.15	0.0-2.9	.43	.49		
Oshtemo---------	0-15	5-15	1.40-1.70	6.00-20.00	0.06-0.12	0.0-2.9	.17	.17	4	2
	15-32	10-20	1.60-1.80	2.00-6.00	0.10-0.18	0.0-2.9	.20	.20		
	32-62	5-15	1.60-1.80	2.00-6.00	0.08-0.16	0.0-2.9	.05	.10		
	62-80	0-5	1.60-1.80	20.00-20.00	0.02-0.04	0.0-2.9	.02	.10		
UgvA, UgvB:										
Urban land.										
Tyner-----------	0-12	3-8	1.40-1.55	6.00-20.00	0.10-0.12	0.0-2.9	.10	.10	5	2
	12-20	3-8	1.45-1.60	6.00-20.00	0.09-0.11	0.0-2.9	.10	.10		
	20-41	1-6	1.55-1.70	6.00-20.00	0.06-0.08	0.0-2.9	.05	.05		
	41-80	1-6	1.55-1.70	6.00-20.00	0.05-0.07	0.0-2.9	.02	.02		
UgwA:										
Urban land.										
Vistula---------	0-10	5-10	1.50-1.70	6.00-20.00	0.10-0.12	0.0-2.9	.10	.10	5	2
	10-21	5-10	1.50-1.70	6.00-20.00	0.09-0.11	0.0-2.9	.15	.15		
	21-35	5-10	1.50-1.70	6.00-20.00	0.03-0.11	0.0-2.9	.05	.05		
	35-55	3-10	1.50-1.70	6.00-20.00	0.03-0.11	0.0-2.9	.02	.02		
	55-80	0-10	1.60-1.80	20.00-20.00	0.02-0.04	0.0-2.9	.02	.02		
UhbA:										
Urban land.										
Volinia---------	0-9	10-20	1.30-1.65	0.60-2.00	0.07-0.17	0.0-2.9	.20	.20	4	5
	9-23	18-30	1.40-1.70	0.60-2.00	0.07-0.18	3.0-5.9	.10	.15		
	23-58	2-12	1.60-1.70	6.00-20.00	0.06-0.11	0.0-2.9	.02	.02		
	58-80	0-3	1.45-1.75	20.00-20.00	0.02-0.04	0.0-2.9	.02	.02		
Usl:										
Udorthents, rubbish.										
VnxA:										
Vistula---------	0-9	5-10	1.50-1.70	6.00-20.00	0.10-0.12	0.0-2.9	.10	.10	5	2
	9-14	5-10	1.50-1.70	6.00-20.00	0.07-0.11	0.0-2.9	.10	.15		
	14-45	5-12	1.50-1.70	6.00-20.00	0.07-0.11	0.0-2.9	.10	.15		
	45-58	3-10	1.50-1.70	6.00-20.00	0.07-0.11	0.0-2.9	.10	.15		
	58-75	5-15	1.50-1.70	6.00-20.00	0.07-0.11	0.0-2.9	.10	.15		
	75-80	0-3	1.60-1.80	20.00-20.00	0.03-0.05	0.0-2.9	.02	.02		

Table 19.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Erosion factors Kw	Kf	T	Wind erodibility group
	In	Pct	g/cc	In/hr	In/in	Pct				
VolA:										
Volinia---------	0-9	10-20	1.30-1.65	0.60-2.00	0.07-0.17	0.0-2.9	.20	.20	4	5
	9-23	18-30	1.40-1.70	0.60-2.00	0.07-0.18	3.0-5.9	.10	.15		
	23-58	2-12	1.60-1.70	6.00-20.00	0.06-0.11	0.0-2.9	.02	.02		
	58-80	0-3	1.45-1.75	20.00-20.00	0.02-0.04	0.0-2.9	.02	.02		
WcnAI:										
Waterford-------	0-8	10-15	1.30-1.60	2.00-6.00	0.13-0.18	0.0-2.9	.32	.32	4	5
	8-41	10-18	1.45-1.70	2.00-6.00	0.07-0.14	0.0-2.9	.37	.37		
	41-80	0-10	1.45-1.75	20.00-20.00	0.02-0.04	0.0-2.9	.02	.05		
WoaA:										
Williamstown----	0-9	14-24	1.30-1.60	0.60-2.00	0.10-0.24	0.0-2.9	.37	.37	4	5
	9-33	27-35	1.40-1.70	0.20-0.60	0.12-0.21	3.0-5.9	.37	.37		
	33-37	15-27	1.50-1.70	0.20-0.60	0.04-0.12	0.0-2.9	.37	.43		
	37-60	10-20	1.75-2.00	0.01-0.20	0.02-0.04	0.0-2.9	.37	.49		
WobB:										
Williamstown----	0-9	14-24	1.30-1.60	0.60-2.00	0.10-0.24	0.0-2.9	.37	.37	5	5
	9-33	27-35	1.40-1.70	0.20-0.60	0.12-0.21	3.0-5.9	.37	.37		
	33-37	15-27	1.50-1.70	0.20-0.60	0.04-0.12	0.0-2.9	.37	.43		
	37-60	10-20	1.75-2.00	0.01-0.20	0.02-0.04	0.0-2.9	.37	.49		
Crosier---------	0-11	5-25	1.20-1.65	0.60-2.00	0.16-0.19	0.0-2.9	.37	.37	4	5
	11-30	20-34	1.40-1.70	0.60-2.00	0.12-0.19	3.0-5.9	.32	.37		
	30-38	12-25	1.60-1.80	0.20-0.60	0.12-0.16	0.0-2.9	.37	.43		
	38-60	10-20	1.75-2.00	0.06-0.20	0.02-0.04	0.0-2.9	.37	.43		
WocC2:										
Williamstown----	0-9	14-24	1.30-1.60	0.60-2.00	0.10-0.24	0.0-2.9	.37	.37	5	5
	9-33	27-35	1.40-1.70	0.20-0.60	0.12-0.21	3.0-5.9	.37	.37		
	33-37	15-27	1.50-1.70	0.20-0.60	0.04-0.12	0.0-2.9	.37	.43		
	37-60	10-20	1.75-2.00	0.01-0.20	0.02-0.04	0.0-2.9	.37	.49		
WodC3:										
Williamstown----	0-9	27-33	1.40-1.70	0.20-0.60	0.15-0.21	3.0-5.9	.32	.32	3	6
	9-33	27-35	1.40-1.70	0.20-0.60	0.12-0.21	3.0-5.9	.37	.37		
	33-37	15-27	1.50-1.70	0.20-0.60	0.04-0.12	0.0-2.9	.37	.43		
	37-60	10-20	1.75-2.00	0.01-0.20	0.02-0.04	0.0-2.9	.37	.49		
WrxAN:										
Wunabuna--------	0-19	20-27	1.20-1.65	0.60-2.00	0.17-0.26	0.0-2.9	.37	.37	5	6
	19-32	27-35	1.20-1.45	0.60-2.00	0.16-0.26	3.0-5.9	.32	.32		
	32-38	27-35	1.20-1.45	0.60-2.00	0.16-0.26	3.0-5.9	.24	.24		
	38-80	0-0	0.25-0.75	0.60-6.00	0.35-0.45	0.0-2.9	---	---		

Table 20.--Chemical Properties of the Soils

(Absence of an entry indicates that data were not estimated)

Map symbol and soil name	Depth	Soil reaction	Organic matter	Cation-exchange capacity	Calcium carbonate
	In	pH	Pct	meq/100g	Pct
AahAK:					
Abscota---------	0-5	6.1-7.3	0.5-3.0	3.0-15	0
	5-14	6.1-7.8	0.5-1.0	4.0-8.0	0
	14-60	6.1-8.4	0.0-0.0	1.0-2.0	0
AbhAN:					
Adrian----------	0-34	5.1-7.3	55-75	150-200	0
	34-80	6.1-8.4	---	1.0-3.0	0-40
AbhAU:					
Adrian----------	0-34	5.1-7.3	55-75	150-200	0
	34-80	6.1-8.4	---	1.0-3.0	0-40
BaaA, BaaB:					
Bainter---------	0-9	5.6-7.3	1.0-3.0	4.0-12	0
	9-13	5.1-7.3	0.0-1.0	4.0-11	0
	13-31	5.1-7.3	0.0-1.0	4.0-11	0
	31-54	5.1-7.8	0.0-1.0	4.0-20	0
	54-80	7.4-8.4	0.0-0.5	1.0-3.0	0-30
BbmA:					
Baugo-----------	0-11	5.6-7.3	1.0-3.0	9.0-17	0
	11-29	5.6-7.3	0.0-1.0	12-20	0
	29-36	5.6-7.3	0.0-0.5	4.0-22	0
	36-56	6.1-8.4	0.0-0.2	1.0-3.0	0-25
	56-80	7.4-8.4	0.0-0.5	2.0-9.0	15-35
BlaA:					
Blount----------	0-7	5.1-7.3	2.0-3.0	17-22	0
	7-23	4.5-6.5	0.0-1.0	21-30	0
	23-42	6.1-7.8	0.0-0.5	16-25	0-10
	42-80	7.4-8.4	0.0-0.5	16-25	5-30
BlaB:					
Blount----------	0-10	5.1-7.3	2.0-3.0	17-22	0
	10-24	4.5-6.5	0.0-1.0	21-30	0
	24-40	6.1-7.8	0.0-0.5	16-25	0-10
	40-80	7.4-8.4	0.0-0.5	16-25	5-30
BshA:					
Brady-----------	0-9	5.1-7.3	2.0-4.0	5.0-20	0
	9-37	5.1-6.5	0.0-0.0	2.0-12	0
	37-56	5.1-7.3	0.0-0.0	2.0-12	0
	56-60	6.6-8.4	0.0-0.0	1.0-2.0	10-25
BteA, BteB:					
Brems-----------	0-9	5.1-7.3	0.5-1.0	3.0-5.0	0
	9-72	4.5-6.0	0.0-0.5	---	0
	72-80	5.1-6.5	0.0-0.5	1.0-3.0	0
BtxA, BtxB, BtxC, BtxD2, BtxE:					
Bristol--------	0-10	5.1-7.3	1.0-2.0	3.0-5.0	0
	10-21	5.1-7.3	0.0-0.5	2.0-3.0	0
	21-35	5.1-7.3	0.0-0.5	2.0-6.0	0
	35-55	5.1-7.3	0.0-0.5	1.0-6.0	0
	55-80	7.4-8.4	0.0-0.5	0.0-6.0	0-25

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Soil reaction	Organic matter	Cation-exchange capacity	Calcium carbonate
	In	pH	Pct	meq/100g	Pct
BufA:					
Bronson---------	0-8	5.1-7.3	1.0-3.0	5.0-15	0
	8-18	5.1-7.3	0.0-0.5	2.0-10	0
	18-61	5.1-7.3	0.0-0.5	4.0-15	0
	61-80	7.4-8.4	0.0-0.5	1.0-2.0	5-25
BuuA:					
Brookston-------	0-9	6.1-7.3	3.0-5.0	20-24	0
	9-48	6.1-7.8	0.5-2.0	8.0-20	0
	48-68	6.1-8.4	0.0-0.5	3.0-16	0-15
	68-80	7.4-8.4	0.0-0.5	2.0-9.0	15-35
CnbA, CnbB, CnbC:					
Coloma----------	0-12	4.5-7.3	0.5-2.0	1.0-12	0
	12-47	4.5-7.3	0.0-0.5	0.1-9.0	0
	47-80	4.5-7.3	0.0-0.5	0.4-11	0
CosA, CosB:					
Cosperville-----	0-9	5.6-7.3	2.0-3.0	7.0-15	0
	9-38	5.6-7.3	0.5-1.0	9.0-27	0
	38-48	6.1-8.4	0.5-1.0	9.0-20	0-10
	48-64	7.4-8.4	0.0-0.5	8.0-20	10-20
	64-76	7.4-8.4	0.0-0.5	4.0-11	20-35
	76-84	7.4-8.4	0.0-0.5	1.0-3.0	20-50
CvdA, CvdB:					
Crosier---------	0-11	5.6-7.3	1.0-3.0	7.0-17	0
	11-30	5.1-7.3	0.0-1.0	8.0-20	0
	30-38	6.1-8.4	0.0-0.5	3.0-16	0-15
	38-60	7.4-8.4	0.0-0.5	2.0-9.0	15-35
DcrA:					
Del Rey---------	0-9	5.6-7.3	2.0-3.0	17-21	0
	9-33	4.5-7.3	0.0-1.0	18-24	0-10
	33-90	7.9-8.4	0.0-0.5	12-18	5-40
DdeA, DdeB:					
Desker----------	0-9	5.6-6.5	1.0-3.0	5.0-20	0
	9-25	5.6-7.3	0.5-1.0	6.0-12	0
	25-34	7.4-8.4	0.5-1.0	3.0-8.0	5-10
	34-60	7.9-8.4	0.0-0.5	0.0-5.0	15-25
EchAN:					
Edwards---------	0-32	4.5-7.8	55-75	150-230	0
	32-80	7.4-8.4	0.0-20	1.0-10	50-90
EchAU:					
Edwards---------	0-32	4.5-7.8	55-75	150-230	0
	32-80	7.4-8.4	0.0-20	1.0-10	50-90
GczA:					
Gilford---------	0-14	5.6-7.3	2.0-4.0	6.0-20	0
	14-32	5.6-7.3	0.0-1.0	4.0-14	0
	32-48	6.1-7.3	0.0-0.5	1.0-9.0	0
	48-60	6.6-8.4	0.0-0.5	1.0-6.0	0-30
GdnA:					
Gilford---------	0-14	5.6-7.3	2.0-4.0	6.0-20	0
	14-32	5.6-7.3	0.0-1.0	4.0-14	0
	32-48	6.1-7.3	0.0-0.5	1.0-9.0	0
	48-60	6.6-8.4	0.0-0.5	1.0-6.0	0-30

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Soil reaction	Organic matter	Cation-exchange capacity	Calcium carbonate
	In	pH	Pct	meq/100g	Pct
GlaB, GlaC:					
Glynwood--------	0-9	5.1-7.3	1.0-3.0	12-22	0
	9-23	4.5-7.8	0.5-1.0	20-33	0
	23-60	7.4-8.4	0.3-0.5	11-27	22-35
GndA:					
Granby----------	0-10	5.6-7.3	4.0-6.0	5.0-20	0
	10-32	5.6-7.8	0.0-0.8	1.0-10	0
	32-60	6.6-8.4	0.0-0.5	1.0-3.0	0
GocAK, GodAI:					
Gravelton-------	0-11	6.1-7.8	2.0-5.0	10-17	0-5
	11-16	6.6-7.8	0.5-1.0	4.0-16	0-5
	16-48	7.4-8.4	0.0-0.5	1.0-3.0	0-10
	48-80	7.4-8.4	0.0-0.5	1.0-3.0	2-20
HhaAP:					
Histosols-------	0-40	5.6-7.3	20-99	---	---
	40-60	5.6-7.3	0.0-0.5	0.0-5.0	0
HtbAN, HtbAU:					
Houghton--------	0-80	4.5-7.8	70-99	140-200	0
JaaAK:					
Jamestown-------	0-11	6.1-7.3	2.0-4.0	12-27	0
	11-33	6.1-7.3	0.5-2.0	8.0-25	0
	33-44	6.1-7.8	0.5-1.0	5.0-15	0
	44-52	6.1-7.8	0.0-0.5	2.0-6.0	0-5
	52-80	7.4-8.4	0.0-0.5	2.0-9.0	15-35
KimA:					
Kimmell---------	0-8	5.6-7.3	2.0-3.0	7.0-15	0
	8-12	5.6-7.3	0.5-2.0	5.0-11	0
	12-32	5.6-7.3	0.0-1.0	9.0-27	0
	32-37	6.1-8.4	0.0-0.5	11-26	0-5
	37-75	7.4-8.4	0.0-0.5	7.0-11	20-35
	75-99	7.4-8.4	0.0-0.5	1.0-3.0	20-35
MfrAN:					
Madaus----------	0-9	6.1-8.4	30-75	150-200	0
	9-48	7.4-8.4	0.0-20	1.0-10	50-90
	48-80	7.4-8.4	0.0-1.0	1.0-3.0	0-40
MftA:					
Matherton-------	0-9	5.6-7.3	2.0-4.0	10-20	0
	9-34	5.1-7.3	0.0-1.0	5.0-20	0
	34-80	7.4-8.4	0.0-0.5	1.0-2.0	10-25
MgcA:					
Maumee----------	0-23	5.6-7.8	2.0-4.0	8.0-10	0
	23-38	5.6-7.3	0.0-1.0	2.0-6.0	0
	38-60	6.1-8.4	0.0-0.5	1.0-3.0	0-30
MmdC2:					
Miami-----------	0-8	5.6-7.3	1.0-3.0	7.0-17	0
	8-31	5.1-6.5	0.0-0.5	9.0-20	0
	31-36	6.6-7.8	0.0-0.5	4.0-11	0-20
	36-60	7.4-8.4	0.0-0.5	2.0-9.0	15-40

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Soil reaction	Organic matter	Cation-exchange capacity	Calcium carbonate
	In	pH	Pct	meq/100g	Pct
MmdC3:					
Miami-----------	0-8	5.6-7.3	0.5-2.0	10-21	0
	8-31	5.1-6.5	0.0-0.5	9.0-20	0
	31-36	6.6-7.8	0.0-0.5	4.0-11	0-20
	36-60	7.4-8.4	0.0-0.5	2.0-9.0	15-40
MmdD2:					
Miami-----------	0-8	5.6-7.3	1.0-3.0	7.0-17	0
	8-31	5.1-6.5	0.0-0.5	9.0-20	0
	31-36	6.6-7.8	0.0-0.5	4.0-11	0-20
	36-60	7.4-8.4	0.0-0.5	2.0-9.0	15-40
MmdD3:					
Miami-----------	0-8	5.6-7.3	0.5-2.0	10-21	0
	8-31	5.1-6.5	0.0-0.5	9.0-20	0
	31-36	6.6-7.8	0.0-0.5	4.0-11	0-20
	36-60	7.4-8.4	0.0-0.5	2.0-9.0	15-40
MouAN:					
Milford---------	0-11	5.6-7.3	1.0-3.0	14-28	0
	11-49	6.6-7.8	0.5-2.0	22-29	0-15
	49-80	7.4-8.4	0.0-1.0	4.0-18	0-30
MsaA:					
Mishawaka-------	0-12	5.1-7.3	2.0-4.0	10-16	0
	12-18	5.1-6.0	1.0-3.0	4.0-12	0
	18-25	5.1-6.0	0.5-1.0	2.0-11	0
	25-58	5.1-6.0	0.0-0.5	1.0-3.0	0
	58-80	5.1-6.0	0.0-0.5	1.0-3.0	0
MvkA:					
Morocco---------	0-9	4.5-7.3	0.5-2.0	3.0-5.0	0
	9-35	4.5-6.0	0.0-0.5	---	0
	35-60	4.5-6.0	0.0-0.5	---	0
MwzAN, MwzAU:					
Muskego---------	0-9	5.6-7.3	60-90	140-180	0
	9-27	5.6-7.3	60-90	150-190	0
	27-80	6.6-8.4	6.0-20	10-45	0-20
OmgA, OmgB:					
Osolo-----------	0-9	5.1-7.3	0.5-2.0	2.0-5.0	0
	9-25	5.1-7.3	0.0-0.5	1.0-3.0	0
	25-66	5.1-7.3	0.0-0.5	1.0-3.0	0
	66-80	5.1-7.3	0.0-0.5	1.0-3.0	0
PaaAN:					
Palms-----------	0-35	5.1-7.8	75-99	150-180	0
	35-80	6.1-8.4	0.0-0.0	2.0-15	0-30
PkdA:					
Pewamo----------	0-13	6.1-7.3	3.0-5.0	10-25	0
	13-37	5.6-7.8	0.5-2.0	10-20	0-5
	37-60	7.4-8.4	0.0-1.0	5.0-15	15-30
Pmg:					
Pits------------	0-60	6.6-8.4	0.0-0.5	---	---
ReyAN:					
Rensselaer------	0-15	6.1-7.3	3.0-6.0	11-28	0
	15-38	6.1-7.3	1.0-3.0	10-27	0
	38-42	6.6-7.8	0.5-1.0	9.0-20	0-20
	42-60	7.4-8.4	0.5-1.0	4.0-14	15-40

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Soil reaction	Organic matter	Cation-exchange capacity	Calcium carbonate
	In	pH	Pct	meq/100g	Pct
RopA, RopB:					
Riddles---------	0-8	5.6-7.3	0.5-2.0	7.0-15	0
	8-33	5.1-7.3	0.0-1.0	8.0-20	0
	33-63	5.1-7.3	0.0-0.5	8.0-20	0
	63-90	5.1-7.3	0.0-0.5	8.0-20	0
	90-99	7.4-8.4	0.0-0.5	2.0-9.0	10-30
Oshtemo---------	0-15	5.1-7.3	1.0-3.0	4.0-14	0
	15-32	5.1-7.3	0.5-1.0	5.0-15	0
	32-62	5.6-7.3	0.5-1.0	3.0-11	0
	62-80	7.4-8.4	0.5-1.0	1.0-5.0	20-40
RoqC2, RoqD2:					
Riddles---------	0-8	5.6-7.3	0.5-2.0	7.0-15	0
	8-33	5.1-7.3	0.0-1.0	8.0-20	0
	33-63	5.1-7.3	0.0-0.5	8.0-20	0
	63-90	5.1-7.3	0.0-0.5	8.0-20	0
	90-99	7.4-8.4	0.0-0.5	2.0-9.0	10-30
Metea-----------	0-9	5.6-7.3	0.5-2.0	2.0-9.0	0
	9-28	5.1-6.5	0.0-0.5	1.0-6.0	0
	28-32	5.6-6.5	---	4.0-14	0
	32-44	5.6-7.3	---	9.0-21	0
	44-60	7.4-8.4	---	6.0-15	10-40
RosE:					
Riddles---------	0-8	5.6-7.3	0.5-2.0	7.0-15	0
	8-33	5.1-7.3	0.0-1.0	8.0-20	0
	33-63	5.1-7.3	0.0-0.5	8.0-20	0
	63-90	5.1-7.3	0.0-0.5	8.0-20	0
	90-99	7.4-8.4	0.0-0.5	2.0-9.0	10-30
Tyner-----------	0-12	4.5-7.3	0.5-1.0	3.0-5.0	0
	12-20	4.5-7.3	0.0-0.5	2.0-6.0	0
	20-41	4.5-7.3	0.0-0.5	1.0-6.0	0
	41-80	4.5-7.3	0.0-0.5	1.0-3.0	0
ScuA, SdnA:					
Sebewa----------	0-14	6.1-7.8	2.0-12	5.0-35	0-15
	14-36	6.1-7.8	0.0-0.0	3.0-15	0-15
	36-60	7.4-8.4	0.0-0.0	1.0-2.0	10-25
SdzA:					
Selfridge-------	0-11	5.6-7.3	1.0-3.0	5.0-15	0
	11-27	5.1-7.3	0.0-0.5	1.0-5.0	0
	27-36	5.6-7.8	0.0-0.5	2.0-10	0
	36-80	7.4-8.4	0.0-0.5	3.0-15	15-40
Crosier---------	0-11	5.6-7.3	1.0-3.0	7.0-17	0
	11-30	5.1-7.3	0.0-1.0	8.0-20	0
	30-38	6.1-8.4	0.0-0.5	3.0-16	0-15
	38-60	7.4-8.4	0.0-0.5	2.0-9.0	15-35
SdzaB:					
Selfridge-------	0-11	5.6-7.3	1.0-3.0	5.0-15	0
	11-27	5.1-7.3	0.0-0.5	1.0-5.0	0
	27-36	5.6-7.8	0.0-0.5	2.0-10	0
	36-80	7.4-8.4	0.0-0.5	3.0-15	15-40
Brems-----------	0-9	5.1-7.3	0.5-1.0	3.0-5.0	0
	9-72	4.5-6.0	0.0-0.5	---	0
	72-80	5.1-6.5	---	1.0-3.0	0

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Soil reaction	Organic matter	Cation-exchange capacity	Calcium carbonate
	In	pH	Pct	meq/100g	Pct
SnlA:					
Southwest-------	0-10	6.1-7.3	1.0-3.0	10-15	0
	10-23	6.1-7.3	1.0-3.0	10-15	0
	23-34	6.1-7.3	3.0-6.0	20-36	0
	34-45	6.1-7.3	0.5-1.0	8.0-19	0
	45-75	6.1-7.8	2.0-5.0	10-33	0-5
	75-80	7.4-8.4	0.0-1.0	2.0-15	5-25
TxuA, TxuB, TxuC, TxuD, TxuF:					
Tyner----------	0-12	4.5-7.3	0.5-1.0	3.0-5.0	0
	12-20	4.5-7.3	0.0-0.5	2.0-6.0	0
	20-41	4.5-7.3	0.0-0.5	1.0-6.0	0
	41-80	4.5-7.3	0.0-0.5	1.0-3.0	0
Uam:					
Udorthents, loamy----------	0-60	6.1-8.4	0.0-0.5	8.0-21	0-25
Uaz:					
Psamments-------	0-60	4.5-6.5	0.5-1.0	1.0-5.0	0
Uba:					
Psammaquents----	0-60	4.5-6.5	0.5-1.0	1.0-5.0	0
UdeA:					
Urban land.					
Bainter---------	0-9	5.6-7.3	1.0-3.0	4.0-12	0
	9-13	5.1-7.3	0.0-1.0	4.0-11	0
	13-31	5.1-7.3	0.0-1.0	4.0-11	0
	31-54	5.1-7.8	0.0-1.0	4.0-20	0
	54-80	7.4-8.4	0.0-0.5	1.0-3.0	0-30
UdkA:					
Urban land.					
Brady-----------	0-9	5.1-7.3	2.0-4.0	5.0-20	0
	9-37	5.1-6.5	0.0-0.0	2.0-12	0
	37-56	5.1-7.3	0.0-0.0	2.0-12	0
	56-60	6.6-8.4	0.0-0.0	1.0-2.0	10-25
UdoA:					
Urban land.					
Brems-----------	0-9	5.1-7.3	0.5-1.0	3.0-5.0	0
	9-72	4.5-6.0	0.0-0.5	---	0
	72-80	5.1-6.5	---	1.0-3.0	0
UdpA, UdpB:					
Urban land.					
Bristol---------	0-10	5.1-7.3	1.0-2.0	3.0-5.0	0
	10-21	5.1-7.3	0.0-0.5	2.0-3.0	0
	21-35	5.1-7.3	0.0-0.5	2.0-6.0	0
	35-55	5.1-7.3	0.0-0.5	1.0-6.0	0
	55-80	7.4-8.4	0.0-0.5	0.0-6.0	0-25

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Soil reaction	Organic matter	Cation-exchange capacity	Calcium carbonate
	In	pH	Pct	meq/100g	Pct
UdrA:					
Urban land.					
Bronson---------	0-8	5.1-7.3	1.0-3.0	5.0-15	0
	8-18	5.1-7.3	0.0-0.5	2.0-10	0
	18-61	5.1-7.3	0.0-0.5	4.0-15	0
	61-80	7.4-8.4	0.0-0.5	1.0-2.0	5-25
UeaA:					
Urban land.					
Crosier---------	0-11	5.6-7.3	1.0-3.0	7.0-17	0
	11-30	5.1-7.3	0.0-1.0	8.0-20	0
	30-38	6.1-8.4	0.0-0.5	3.0-16	0-15
	38-60	7.4-8.4	0.0-0.5	2.0-9.0	15-35
UeqA:					
Urban land.					
Gilford---------	0-14	5.6-7.3	2.0-4.0	6.0-20	0
	14-32	5.6-7.3	0.0-1.0	4.0-14	0
	32-48	6.1-7.3	0.0-0.5	1.0-9.0	0
	48-60	6.6-8.4	0.0-0.5	1.0-6.0	0-30
UfzA:					
Urban land.					
Mishawaka-------	0-12	5.1-7.3	2.0-4.0	10-16	0
	12-18	5.1-6.0	1.0-3.0	4.0-12	0
	18-25	5.1-6.0	0.5-1.0	2.0-11	0
	25-58	5.1-6.0	0.0-0.5	1.0-3.0	0
	58-80	5.1-6.0	0.0-0.5	1.0-3.0	0
UgaA:					
Urban land.					
Morocco---------	0-9	4.5-7.3	0.5-2.0	3.0-5.0	0
	9-35	4.5-6.0	0.0-0.5	---	0
	35-60	4.5-6.0	0.0-0.5	---	0
UglA:					
Urban land.					
Osolo-----------	0-9	5.1-7.3	0.5-2.0	2.0-5.0	0
	9-25	5.1-7.3	0.0-0.5	1.0-3.0	0
	25-66	5.1-7.3	0.0-0.5	1.0-3.0	0
	66-80	5.1-7.3	0.0-0.5	1.0-3.0	0
UgrA:					
Urban land.					
Rensselaer------	0-11	6.1-7.3	3.0-6.0	16-22	0
	11-20	6.1-7.3	.05-2.0	4.0-20	0
	20-35	6.1-7.3	0.0-0.5	4.0-11	0
	35-45	6.6-7.8	0.0-0.5	1.0-11	0-25
	45-53	6.6-8.4	0.0-0.5	1.0-3.0	0-25
	53-80	7.4-8.4	0.0-0.5	2.0-9.0	15-35

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Soil reaction	Organic matter	Cation-exchange capacity	Calcium carbonate
	In	pH	Pct	meq/100g	Pct
UgsB:					
Urban land.					
Riddles---------	0-8	5.1-7.3	0.5-2.0	7.0-15	0
	8-33	4.5-7.3	0.0-1.0	8.0-20	0
	33-63	5.1-7.8	0.0-0.5	8.0-20	0
	63-90	5.1-8.4	0.0-0.5	8.0-20	0
	90-99	7.4-8.4	0.0-0.5	2.0-9.0	10-30
Oshtemo---------	0-15	5.6-7.3	1.0-3.0	4.0-14	0
	15-32	5.1-7.3	0.5-1.0	5.0-15	0
	32-62	5.6-7.3	0.5-1.0	3.0-11	0-10
	62-80	7.4-8.4	0.5-1.0	1.0-5.0	20-40
UgvA, UgvB:					
Urban land.					
Tyner-----------	0-12	4.5-7.3	0.5-1.0	3.0-5.0	0
	12-20	4.5-7.3	0.0-0.5	2.0-6.0	0
	20-41	4.5-7.3	0.0-0.5	1.0-6.0	0
	41-80	4.5-7.3	0.0-0.5	1.0-3.0	0
UgwA:					
Urban land.					
Vistula---------	0-10	5.6-7.3	1.0-2.0	3.0-5.0	0
	10-21	5.6-7.3	0.0-0.5	2.0-3.0	0
	21-35	5.6-7.3	0.0-0.5	2.0-6.0	0-5
	35-55	5.6-7.3	0.0-0.5	1.0-6.0	0-5
	55-80	7.4-8.4	0.0-0.5	0.0-6.0	0-25
UhbA:					
Urban land.					
Volinia---------	0-9	5.6-7.3	2.0-4.0	10-20	0
	9-23	5.1-7.3	1.0-2.0	10-20	0
	23-58	6.1-7.3	0.0-0.5	1.0-3.0	0-5
	58-80	7.4-8.4	0.0-0.5	1.0-3.0	20-50
Usl:					
Udorthents, rubbish.					
VnxA:					
Vistula---------	0-9	5.6-7.3	1.0-2.0	3.0-5.0	0
	9-14	5.6-7.3	0.0-0.5	2.0-3.0	0
	14-45	5.6-7.3	0.0-0.5	2.0-6.0	0
	45-58	5.6-7.3	0.0-0.5	1.0-6.0	0
	58-75	7.4-8.4	0.0-0.5	2.0-6.0	0-25
	75-80	7.4-8.4	0.0-0.5	1.0-3.0	0-25
VolA:					
Volinia---------	0-9	5.6-7.3	2.0-4.0	10-20	0
	9-23	5.1-7.3	1.0-2.0	10-20	0
	23-58	6.1-7.3	0.0-0.5	1.0-3.0	0-5
	58-80	7.4-8.4	0.0-0.5	1.0-3.0	20-50
WcnAI:					
Waterford-------	0-8	6.1-7.8	1.0-3.0	10-17	0-5
	8-41	6.1-7.8	0.5-1.0	4.0-16	0-5
	41-80	6.6-8.4	0.0-0.5	1.0-3.0	5-25

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Soil reaction	Organic matter	Cation-exchange capacity	Calcium carbonate
	In	pH	Pct	meq/100g	Pct
WoaA:					
Williamstown----	0-9	5.1-7.3	1.0-3.0	4.0-17	0
	9-33	5.1-7.3	0.5-1.0	9.0-20	0
	33-37	6.6-8.4	0.0-1.0	6.0-16	0-40
	37-60	7.4-8.4	0.0-0.5	2.0-9.0	15-40
WobB:					
Williamstown----	0-9	5.1-7.3	1.0-3.0	4.0-17	0
	9-33	5.1-7.3	0.5-1.0	9.0-20	0
	33-37	6.6-8.4	0.0-1.0	6.0-16	0-40
	37-60	7.4-8.4	0.0-0.5	2.0-9.0	15-40
Crosier---------	0-11	5.6-7.3	1.0-3.0	7.0-17	0
	11-30	5.1-7.3	0.0-1.0	8.0-20	0
	30-38	6.1-8.4	0.0-0.5	3.0-16	0-15
	38-60	7.4-8.4	0.0-0.5	2.0-9.0	15-35
WocC2:					
Williamstown----	0-9	5.1-7.3	1.0-3.0	4.0-17	0
	9-33	5.1-7.3	0.5-1.0	9.0-20	0
	33-37	6.6-8.4	0.0-1.0	6.0-16	0-40
	37-60	7.4-8.4	0.0-0.5	2.0-9.0	15-40
WodC3:					
Williamstown----	0-9	5.1-7.3	0.5-1.0	10-23	0
	9-33	5.1-7.3	0.5-1.0	9.0-20	0
	33-37	6.6-8.4	0.0-1.0	6.0-16	0-40
	37-60	7.4-8.4	0.0-0.5	2.0-9.0	15-40
WrxAN:					
Wunabuna--------	0-19	6.1-7.8	2.0-4.0	10-15	0
	19-32	6.1-7.8	1.0-2.0	10-19	0
	32-38	6.1-7.8	4.0-8.0	15-36	0
	38-80	5.1-7.8	60-90	125-200	0

Table 21.--Water Features

(See text for definitions of terms used in this table. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Map symbol and soil name	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table and ponding: Water table depth	Kind of water table	Months	Maximum ponding depth	Ponding duration
					Ft			Ft	
AahAK:									
Abscota	A	Occasional	Brief	Mar-Jun	1.5-3.0	Apparent	Dec-Apr	---	---
AbhAN:									
Adrian	A/D	---	---	---	0.0-0.5	Apparent	Nov-May	0.0-2.0	Long.
AbhAU:									
Adrian	A/D	---	---	---	0.0-0.5	Apparent	Nov-May	0.0-2.0	Long.
BaaA, BaaB:									
Bainter	B	---	---	---	>6.0	---	---	---	---
BbmA:									
Baugo	C	---	---	---	0.5-2.0	Perched	Dec-Apr	---	---
BlaA, BlaB:									
Blount	C	---	---	---	0.5-2.0	Perched	Dec-Apr	---	---
BshA:									
Brady	B	---	---	---	0.5-2.0	Apparent	Dec-Apr	---	---
BteA, BteB:									
Brems	A	---	---	---	1.5-3.0	Apparent	Dec-Apr	---	---
BtxA, BtxB, BtxC, BtxD2, BtxE:									
Bristol	A	---	---	---	>6.0	---	---	---	---
BufA:									
Bronson	B	---	---	---	2.0-3.0	Apparent	Dec-Apr	---	---
BuuA:									
Brookston	B/D	---	---	---	0.0-1.0	Apparent	Dec-May	0.0-0.5	Brief.
CnbA, CnbB, CnbC:									
Coloma	A	---	---	---	>6.0	---	---	---	---
CosA, CosB:									
Cosperville	C	---	---	---	3.0-6.0	Perched	Dec-Apr	---	---
CvdA:									
Crosier	C	---	---	---	0.5-2.0	Perched	Dec-Apr	---	---
CvdB:									
Crosier	C	---	---	---	0.5-2.0	Perched	Dec-Apr	---	---
DcrA:									
Del Rey	C	---	---	---	0.5-2.0	Perched	Dec-Apr	---	---
DdeA, DdeB:									
Desker	A	---	---	---	>6.0	---	---	---	---
EchAN:									
Edwards	B/D	---	---	---	0.0-0.5	Apparent	Nov-May	0.0-2.0	Long.
EchAU:									
Edwards	B/D	---	---	---	0.0-0.5	Apparent	Oct-Aug	0.0-2.0	Long.

Table 21.--Water Features--Continued

Map symbol and soil name	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table and ponding: Water table depth	Kind of water table	Months	Maximum ponding depth	Ponding duration
					Ft			Ft	
GczA, GdnA:									
Gilford----------	B/D	---	---	---	0.0-1.0	Apparent	Dec-May	0.0-0.5	Brief.
GlaB, GlaC:									
Glynwood--------	C	---	---	---	1.5-2.5	Perched	Dec-Apr	---	---
GndA:									
Granby----------	A/D	---	---	---	0.0-1.0	Apparent	Dec-May	0.0-0.5	Brief.
GocAK:									
Gravelton-------	B/D	Occasional	Long------	Nov-Apr	0.0-0.5	Apparent	Nov-May	0.0-2.0	Long.
GodAI:									
Gravelton-------	B/D	Frequent	Long------	Nov-Jun	0.0-0.5	Apparent	Nov-May	0.5-2.0	Long.
HhaAP:									
Histosols-------	D	---	---	---	0.0-0.5	Apparent	Nov-May	0.0-2.0	Long.
HtbAN:									
Houghton--------	A/D	---	---	---	0.0-0.5	Apparent	Nov-May	0.0-2.0	Long.
HtbAU:									
Houghton--------	A/D	---	---	---	0.0-0.5	Apparent	Nov-May	0.0-2.0	Long.
JaaAK:									
Jamestown-------	C	Occasional	Brief-----	Oct-Jun	0.5-2.0	Perched	Dec-Apr	---	---
KimA:									
Kimmell---------	C	---	---	---	0.5-2.0	Perched	Dec-Apr	---	---
MfrAN:									
Madaus----------	B/D	---	---	---	0.0-0.5	Apparent	Nov-May	0.0-2.0	Long.
MftA:									
Matherton-------	B	---	---	---	0.5-1.5	Apparent	Dec-Apr	---	---
MgcA:									
Maumee----------	A/D	---	---	---	0.0-1.0	Apparent	Nov-May	0.0-0.5	Brief.
MmdC2, MmdC3, MmdD2, MmdD3:									
Miami-----------	B	---	---	---	2.0-3.5	Perched	Dec-Apr	---	---
MouAN:									
Milford---------	B/D	---	---	---	0.0-0.5	Apparent	Nov-May	0.0-2.0	Brief.
MsaA:									
Mishawaka-------	A	---	---	---	>6.0	---	---	---	---
MvkA:									
Morocco---------	B	---	---	---	0.5-2.0	Apparent	Dec-Apr	---	---
MwzAN:									
Muskego---------	A/D	---	---	---	0.0-0.5	Apparent	Nov-May	0.0-2.0	Long.
MwzAU:									
Muskego---------	A/D	---	---	---	0.0-0.5	Apparent	Nov-May	0.0-2.0	Long.

Table 21.--Water Features--Continued

Map symbol and soil name	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table and ponding: Water table depth	Kind of water table	Months	Maximum ponding depth	Ponding duration
					Ft			Ft	
OmgA, OmgB:									
Osolo	A	---	---	---	3.5-6.0	Apparent	Dec-Apr	---	---
PaaAN:									
Palms	A/D	---	---	---	0.0-0.5	Apparent	Nov-May	0.0-2.0	Long.
PkdA:									
Pewamo	C/D	---	---	---	0.0-0.5	Apparent	Nov-May	0.0-0.5	Long.
Pmg:									
Pits	A	---	---	---	---	---	---	---	---
ReyAN:									
Rensselaer	B	---	---	---	0.0-1.0	Apparent	Dec-May	0.0-0.5	Brief.
RopA, RopB:									
Riddles	B	---	---	---	>6.0	---	---	---	---
Oshtemo	B	---	---	---	>6.0	---	---	---	---
RoqC2, RoqD2:									
Riddles	B	---	---	---	>6.0	---	---	---	---
Metea	B	---	---	---	>6.0	---	---	---	---
RosE:									
Riddles	B	---	---	---	>6.0	---	---	---	---
Tyner	A	---	---	---	>6.0	---	---	---	---
ScuA:									
Sebewa	B/D	---	---	---	0.0-1.0	Apparent	Nov-May	0.0-0.5	Brief.
SdnA:									
Sebewa	B/D	---	---	---	0.0-1.0	Apparent	Nov-May	0.0-1.0	Long.
SdzA:									
Selfridge	B	---	---	---	0.5-2.0	Perched	Dec-Apr	---	---
Crosier	C	---	---	---	0.5-2.0	Perched	Dec-Apr	---	---
SdzaB:									
Selfridge	B	---	---	---	1.5-2.0	Perched	Dec-Apr	---	---
Brems	A	---	---	---	1.5-3.0	Apparent	Dec-Apr	---	---
SnlA:									
Southwest	D	---	---	---	0.0-0.5	Apparent	Dec-May	0.0-0.5	Brief.
TxuA, TxuB, TxuC, TxuD, TxuF:									
Tyner	A	---	---	---	>6.0	---	---	---	---
Uam:									
Udorthents, loamy	C	---	---	---	2.5-6.0	Perched	Mar-May	---	---
Uaz:									
Psamments	A	---	---	---	>6.0	---	---	---	---
Uba:									
Psammaquents	A	---	---	---	---	---	---	---	---

Table 21.--Water Features--Continued

Map symbol and soil name	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table and ponding: Water table depth	Kind of water table	Months	Maximum ponding depth	Ponding duration
					Ft			Ft	
UdeA:									
Urban land.									
Bainter	B	---	---	---	>6.0	---	---	---	---
UdkA:									
Urban land.									
Brady	B	---	---	---	0.5-2.0	Apparent	Dec-Apr	---	---
UdoA:									
Urban land.									
Brems	A	---	---	---	1.5-3.0	Apparent	Dec-Apr	---	---
UdpA, UdpB:									
Urban land.									
Bristol	A	---	---	---	>6.0	---	---	---	---
UdrA:									
Urban land.									
Bronson	B	---	---	---	1.5-2.5	Apparent	Dec-Apr	---	---
UeaA:									
Urban land.									
Crosier	C	---	---	---	0.5-2.0	Perched	Dec-Apr	---	---
UeqA:									
Urban land.									
Gilford	B/D	---	---	---	0.0-1.0	Apparent	Dec-May	0.0-0.5	Brief.
UfzA:									
Urban land.									
Mishawaka	A	---	---	---	>6.0	---	---	---	---
UgaA:									
Urban land.									
Morocco	B	---	---	---	0.5-2.0	Apparent	Dec-Apr	---	---
UglA:									
Urban land.									
Osolo	A	---	---	---	3.5-6.0	Apparent	Dec-Apr	---	---
UgrA:									
Urban land.									
Rensselaer	B	---	---	---	0.0-1.0	Apparent	Nov-May	0.0-0.5	Brief.
UgsB:									
Urban land.									
Riddles	B	---	---	---	>6.0	---	---	---	---
Oshtemo	B	---	---	---	>6.0	---	---	---	---

Table 21.--Water Features--Continued

Map symbol and soil name	Hydro-logic group	Flooding			High water table and ponding				
		Frequency	Duration	Months	Water table depth	Kind of water table	Months	Maximum ponding depth	Ponding duration
					Ft			Ft	
UgvA, UgvB:									
Urban land.									
Tyner	A	---	---	---	>6.0	---	---	---	---
UgwA:									
Urban land.									
Vistula	A	---	---	---	3.5-6.0	Apparent	Dec-Apr	---	---
UhbA:									
Urban land.									
Volinia	B	---	---	---	>6.0	---	---	---	---
Usl:									
Udorthents, rubbish.									
VnxA:									
Vistula	A	---	---	---	3.5-6.0	Apparent	Dec-Apr	---	---
VolA:									
Volinia	B	---	---	---	>6.0	---	---	---	---
WcnAI:									
Waterford	B	Frequent	Long	Nov-Jun	0.5-1.5	Apparent	Dec-Apr	---	---
WoaA:									
Williamstown	C	---	---	---	1.5-2.5	Perched	Dec-Apr	---	---
WobB:									
Williamstown	C	---	---	---	1.5-2.5	Perched	Dec-Apr	---	---
Crosier	C	---	---	---	0.5-1.0	Perched	Dec-Apr	---	---
WocC2, WodC3:									
Williamstown	C	---	---	---	1.5-2.5	Perched	Dec-Apr	---	---
WrxAN:									
Wunabuna	D	---	---	---	0.0-0.5	Apparent	Nov-May	0.0-2.0	Brief.

Table 22.--Soil Features

(See text for definitions of terms used in this table. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Map symbol and soil name	Depth to bedrock	Subsidence		Potential for frost action	Risk of corrosion	
		Initial	Total		Uncoated steel	Concrete
	In	In	In			
AahAK:						
Abscota	>80	0	---	Low	Low	Low.
AbhAN, AbhAU:						
Adrian	>80	6-17	29-34	High	High	Moderate.
BaaA, BaaB:						
Bainter	>80	0	---	Moderate	Low	Moderate.
BbmA:						
Baugo	>80	0	---	High	High	Moderate.
BlaA, BlaB:						
Blount	>80	0	---	High	High	High.
BshA:						
Brady	>80	0	---	High	Low	Moderate.
BteA, BteB:						
Brems	>80	0	---	Low	Low	High.
BtxA, BtxB, BtxC, BtxD2, BtxE:						
Bristol	>80	0	---	Low	Low	Moderate.
BufA:						
Bronson	>80	0	---	High	Low	Moderate.
BuuA:						
Brookston	>80	0	---	High	High	Low.
CnbA, CnbB, CnbC:						
Coloma	>80	0	---	Low	Low	Moderate.
CosA, CosB:						
Cosperville	>80	0	---	Moderate	High	Moderate.
CvdA, CvdB:						
Crosier	>80	0	---	High	High	Low.
DcrA:						
Del Rey	>80	0	---	High	High	Moderate.
DdeA, DdeB:						
Desker	>80	0	---	Moderate	Moderate	Moderate.
EchAN, EchAU:						
Edwards	>80	4-12	19-24	High	High	Low.
GczA, GdnA:						
Gilford	>80	0	---	High	High	Moderate.
GlaB, GlaC:						
Glynwood	>80	---	---	High	High	Moderate.
GndA:						
Granby	>80	0	---	Moderate	High	Low.

Table 22.--Soil Features--Continued

Map symbol and soil name	Depth to bedrock	Subsidence		Potential for frost action	Risk of corrosion	
		Initial	Total		Uncoated steel	Concrete
	In	In	In			
GocAK, GodAI:						
Gravelton	>80	0	---	High	High	Low.
HhaAP:						
Histosols	>80	12-20	20-40	---	High	Moderate.
HtbAN, HtbAU:						
Houghton	>80	6-18	55-60	High	High	Moderate.
JaaAK:						
Jamestown	>80	0	---	High	High	Low.
KimA:						
Kimmell	>80	0	---	High	Moderate	Moderate.
MfrAN:						
Madaus	>80	0	---	High	High	Low.
MftA:						
Matherton	>80	0	---	High	Moderate	Low.
MgcA:						
Maumee	>80	0	---	Moderate	High	Moderate.
MmdC2, MmdC3, MmdD2, MmdD3:						
Miami	>80	0	---	Moderate	Moderate	Moderate.
MouAN:						
Milford	>80	0	---	High	High	Low.
MsaA:						
Mishawaka	>80	0	---	Low	Low	Moderate.
MvkA:						
Morocco	>80	0	---	Moderate	Low	High.
MwzAN, MwzAU:						
Muskego	>80	10-15	25-30	High	Moderate	Moderate.
OmgA, OmgB:						
Osolo	>80	0	---	Low	Low	Moderate.
PaaAN:						
Palms	>80	2-4	25-32	High	High	Moderate.
PkdA:						
Pewamo	>80	0	---	High	High	Low.
Pmg:						
Pits	>80	0	---	Low	Low	Low.
ReyAN:						
Rensselaer	>80	0	---	High	Moderate	Low.
RopA, RopB:						
Riddles	>80	0	---	Moderate	Moderate	Moderate.
Oshtemo	>80	0	---	Low	Low	High.

Table 22.--Soil Features--Continued

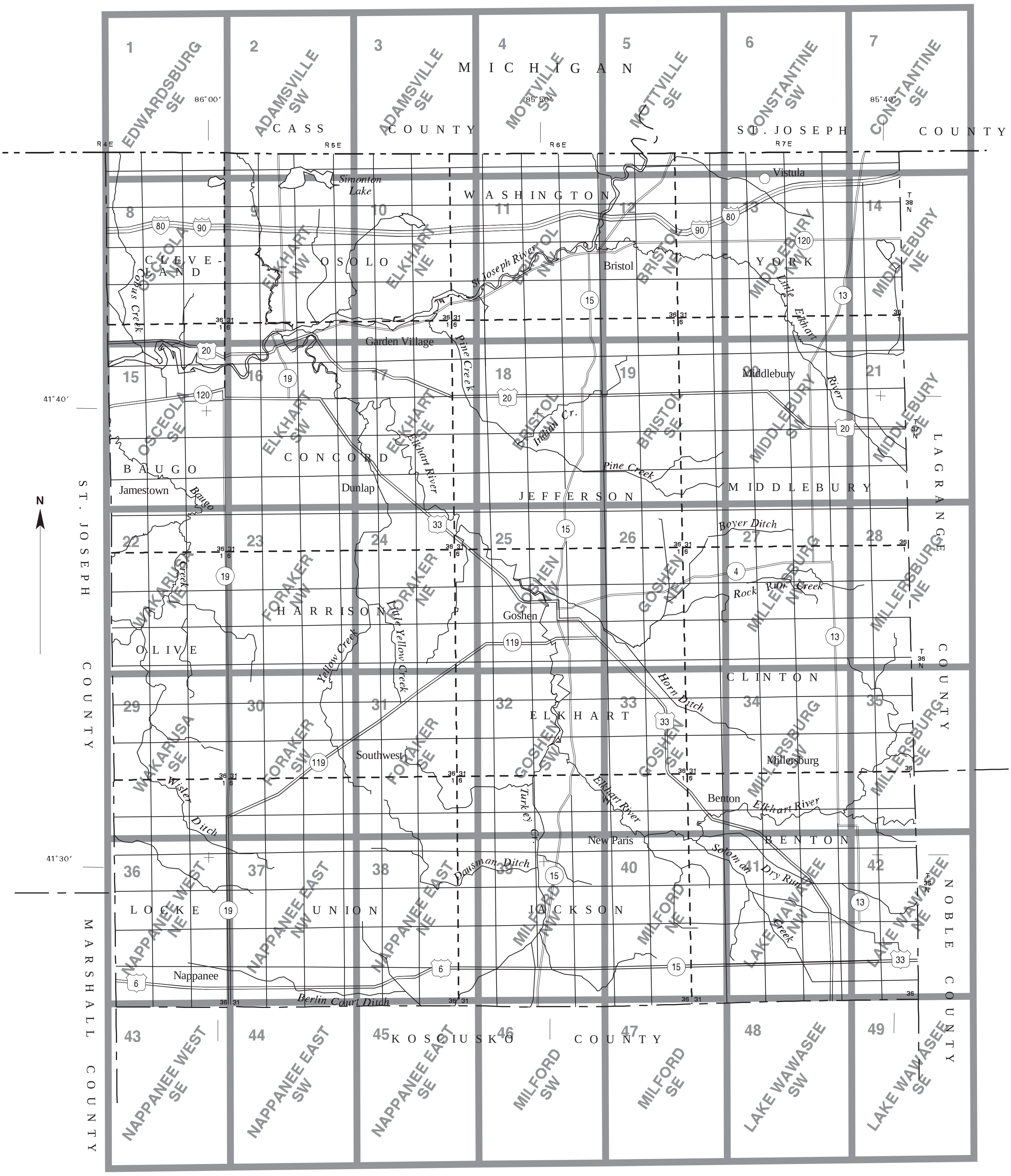
Map symbol and soil name	Depth to bedrock	Subsidence: Initial	Subsidence: Total	Potential for frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
	In	In	In			
RoqC2, RoqD2:						
Riddles	>80	0	---	Moderate	Moderate	Moderate.
Metea	>80	0	---	Moderate	Moderate	Moderate.
RosE:						
Riddles	>80	0	---	Moderate	Moderate	Moderate.
Tyner	>80	0	---	Low	Low	High.
ScuA, SdnA:						
Sebewa	>80	0	---	High	High	Low.
SdzA:						
Selfridge	>80	0	---	High	High	Low.
Crosier	>80	0	---	High	High	Low.
SdzaB:						
Selfridge	>80	0	---	High	High	Low.
Brems	>80	0	---	Low	Low	High.
SnlA:						
Southwest	>80	0	---	High	High	Low.
TxuA, TxuB, TxuC, TxuD, TxuF:						
Tyner	>80	0	---	Low	Low	High.
Uam:						
Udorthents, loamy	>80	0	---	Moderate	High	Moderate.
Uaz:						
Psamments	>80	0	---	Low	Low	High.
Uba:						
Psammaquents	>80	0	---	Low	Low	High.
UdeA:						
Urban land.						
Bainter	>80	0	---	Moderate	Low	Moderate.
UdkA:						
Urban land.						
Brady	>80	0	---	High	Low	Moderate.
UdoA:						
Urban land.						
Brems	>80	0	---	Low	Low	High.
UdpA, UdpB:						
Urban land.						
Bristol	>80	0	---	Low	Low	Moderate.
UdrA:						
Urban land.						
Bronson	>80	0	---	High	Low	Moderate.

Table 22.--Soil Features--Continued

Map symbol and soil name	Depth to bedrock	Subsidence		Potential for frost action	Risk of corrosion	
		Initial	Total		Uncoated steel	Concrete
	In	In	In			
UeaA:						
Urban land.						
Crosier	>80	0	---	High	High	Low.
UeqA:						
Urban land.						
Gilford	>80	0	---	High	High	Moderate.
UfzA:						
Urban land.						
Mishawaka	>80	0	---	Low	Low	Moderate.
UgaA:						
Urban land.						
Morocco	>80	0	---	Moderate	Low	High.
UglA:						
Urban land.						
Osolo	>80	0	---	Low	Low	Moderate.
UgrA:						
Urban land.						
Rensselaer	>80	0	---	High	High	Low.
UgsB:						
Urban land.						
Riddles	>80	0	---	Moderate	Moderate	Moderate.
Oshtemo	>80	0	---	Low	Low	High.
UgvA, UgvB:						
Urban land.						
Tyner	>80	0	---	Low	Low	High.
UgwA:						
Urban land.						
Vistula	>80	0	---	Low	Low	Moderate.
UhbA:						
Urban land.						
Volinia	>80	0	---	Moderate	Low	Moderate.
Usl:						
Udorthents, rubbish.						
VnxA:						
Vistula	>80	---	---	Low	Low	Moderate.
VolA:						
Volinia	>80	---	---	Moderate	Low	Moderate.

Table 22.--Soil Features--Continued

Map symbol and soil name	Depth to bedrock	Subsidence		Potential for frost action	Risk of corrosion	
		Initial	Total		Uncoated steel	Concrete
	In	In	In			
WcnAI:						
Waterford----------	>80	---	---	High--------	Moderate--	Low.
WoaA:						
Williamstown-------	>80	---	---	Moderate----	Moderate--	Moderate.
WobB:						
Williamstown-------	>80	---	---	Moderate----	Moderate--	Moderate.
Crosier------------	>80	---	---	High--------	High------	Low.
WocC2, WodC3:						
Williamstown-------	>80	---	---	Moderate----	Moderate--	Moderate.
WrxAN:						
Wunabuna-----------	>80	---	---	High--------	Moderate--	Low.



SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

INDEX TO MAP SHEETS

ELKHART COUNTY, INDIANA

Scale 1:190080

1 0 1 2 3

MILES

1 0 1 2 3 4 5 6

KILOMETERS

NRCS SOILS 37A
Indiana Offical 37A For
Compilation, Digitizing and DMF
April 18, 2001

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

DESCRIPTION	SYMBOL

CULTURAL FEATURES

BOUNDARIES

National, state, or province

County or parish

Minor civil division

Reservation (Military)

Land grant (Optional)

OTHER BOUNDARY (label)

Airport (Label only) — Davis Airport or Airstrip

LAND DIVISION CORNERS
(section and land grants)

GEOGRAPHIC COORDINATE TICK

ROAD EMBLEMS & DESIGNATIONS

Interstate — 79 — 79 345

Federal — 410 — 410 224

State — 52 — 52 347

HYDROGRAPHIC FEATURES

STREAMS

‡Double line

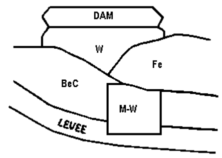
Unclassified (single line)

Drainage end

DESCRIPTION	SYMBOL

SPECIAL SYMBOLS FOR SOIL SURVEY AND SSURGO

SOIL DELINEATIONS AND SYMBOLS



LANDFORM FEATURES
ESCARPMENTS
Bedrock
Other than bedrock
SHORT STEEP SLOPE
GULLY

LEVEES

‡Single side slope
(showing actual feature location)

DEPRESSION, closed
SINKHOLE

EXCAVATIONS
PITS
Borrow pit
Gravel pit
Mine or quarry

MISCELLANEOUS SURFACE FEATURES
Blowout
Clay spot
Gravelly spot
Marsh or swamp
Rock outcrop (includes sandstone and shale)
Sandy spot
Severely eroded spot
Slide or slip
Spoil area
Stony spot
Very stony spot
Wet spot

DESCRIPTION	SYMBOL

SPECIAL SYMBOLS FOR SOIL SURVEY AND SSURGO

RECOMMENDED AD HOC SOIL SYMBOLS

SYMBOL_ID		SYMBOL_ID	
1		23	
2		24	
3		25	
4		26	
5		27	
6		28	
7		29	
8		MUC 30	
9		31	
10		32	
11		33	
12		34	
13		35	
14		36	
OBR 15		37	
16		38	
17		39	
WDP 18		40	
19		41	
20		42	
21		43	
22		UWT 44	

‡ Denotes SSURGO features and symbol.

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey, from 1998 and 1999 aerial photography.

North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 16. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

FEET

KILOMETERS

1	2	3
4		5
6	7	8

1 EDWARDSBURG_NW (MICHIGAN)
2 EDWARDSBURG_NE (MICHIGAN)
3 ADAMSVILLE_NW (MICHIGAN)
4 EDWARDSBURG_SW (ST. JOSEPH COUNTY, IN)
5 ADAMSVILLE_SW (SHEET 2)
6 OSCEOLA_NW (ST. JOSEPH COUNTY, IN)
7 OSCEOLA_NE (SHEET 8)
8 ELKHART_NW (MICHIGAN)

INDEX TO ADJOINING 3.75 MAPS

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey, from 1998 and 1999 aerial photography.

North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 16. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

500 0 500 1000 1500 2000 2500 3000 3500
FEET

0.5 0 0.5
KILOMETERS

QUARTER QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

1 EDWARDSVILLE_NE (MICHIGAN)
2 ADAMSVILLE_NW (MICHIGAN)
3 ADAMSVILLE_NE (MICHIGAN)
4 EDWARDSVILLE_SE (SHEET 1)
5 ADAMSVILLE_SE (SHEET 3)
6 OSCEOLA_NE (SHEET 8)
7 ELKHART_NW (SHEET 9)
8 ELKHART_NE (SHEET 10)

INDEX TO ADJOINING 3.75 MAPS

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North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 16. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

FEET

KILOMETERS

QUARTER QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

1 ADAMSVILLE NW (MICHIGAN)
2 ADAMSVILLE NE (MICHIGAN)
3 MOTTVILLE NW (MICHIGAN)
4 ADAMSVILLE SW (SHEET 2)
5 MOTTVILLE SW (SHEET 4)
6 ELKHART NW (SHEET 9)
7 ELKHART NE (SHEET 10)
8 BRISTOL NW (SHEET 11)

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NORTH

500 0 500 1000 1500 2000 2500 3000 3500

FEET

0.5 0 0.5

KILOMETERS

1	2	3
4		5
6	7	8

1 ADAMSVILLE NE (MICHIGAN)
2 MOTTVILLE NW (MICHIGAN)
3 MOTTVILLE NE (MICHIGAN)
4 ADAMSVILLE SE (SHEET 3)
5 MOTTVILLE SE (SHEET 5)
6 ELKHART NE (SHEET 10)
7 BRISTOL NW (SHEET 11)
8 BRISTOL NE (SHEET 12)

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NORTH

FEET

KILOMETERS

1	2	3
4		5
6	7	8

1 MOTTVILLE NW (MICHIGAN)
2 MOTTVILLE NE (MICHIGAN)
3 CONSTANTINE NW (MICHIGAN)
4 MOTTVILLE SW (SHEET 4)
5 CONSTANTINE SW (SHEET 6)
6 BRISTOL NW (SHEET 11)
7 BRISTOL NE (SHEET 12)
8 MIDDLEBURY NW (SHEET 13)

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NORTH

FEET

0.5 0 0.5

KILOMETERS

1	2	3
4		5
6	7	8

1 MOTTVILLE NE (MICHIGAN)
2 CONSTANTINE NW (MICHIGAN)
3 CONSTANTINE NE (MICHIGAN)
4 MOTTVILLE SE (SHEET 21)
5 CONSTANTINE SE (SHEET 7)
6 BRISTOL NE (SHEET 12)
7 MIDDLEBURY NW (LAGRANGE COUNTY, IN)
8 MIDDLEBURY NE (SHEET 14)

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aerial photography.

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NORTH

FEET

0.5 0 0.5

KILOMETERS

1	2	3
4		5
6	7	8

1 CONSTANTINE NW (MICHIGAN)
2 CONSTANTINE NE (MICHIGAN)
3 KLINGER LAKE NW (MICHIGAN)
4 CONSTANTINE SW (LAGRANGE COUNTY, IN)
5 KLINGER LAKE SW (LAGRANGE COUNTY, IN)
6 MIDDLEBURY NW (SHEET 13)
7 MIDDLEBURY NE (SHEET 14)
8 SHIPSHEWANA NW (LAGRANGE COUNTY, IN)

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1	2	3
4		5
6	7	8

1 EDWARDSBURG SW (ST. JOSEPH COUNTY, IN)
2 EDWARDSBURG SE (SHEET 1)
3 ADAMSVILLE SW (SHEET 2)
4 OSCEOLA NW (ST. JOSEPH COUNTY, IN)
5 ELKHART NW (SHEET 9)
6 OSCEOLA SW (ST. JOSEPH COUNTY, IN)
7 OSCEOLA SE (SHEET 15)
8 ELKHART SW (SHEET 16)

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NORTH

1	2	3
4		5
6	7	8

1 EDWARDSBURG SE (SHEET 1)
2 ADAMSVILLE SW (SHEET 2)
3 ADAMSVILLE SE (SHEET 3)
4 OSCEOLA NE (SHEET 8)
5 ELKHART NE (SHEET 10)
6 OSCEOLA SE (SHEET 15)
7 ELKHART SW (SHEET 16)
8 ELKHART SE (SHEET 17)

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NORTH

FEET

0.5 0 0.5

KILOMETERS

1	2	3
4		5
6	7	8

1 ADAMSVILLE SW (SHEET 2)
2 ADAMSVILLE SE (SHEET 3)
3 MOTTVILLE SW (SHEET 4)
4 ELKHART NW (SHEET 9)
5 BRISTOL NW (SHEET 11)
6 ELKHART SW (SHEET 18)
7 ELKHART SE (SHEET 17)
8 BRISTOL SW (SHEET 18)

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1	2	3
4		5
6	7	8

1 ADAMSVILLE SE (SHEET 3)
2 MOTTVILLE SW (SHEET 4)
3 MOTTVILLE SE (SHEET 5)
4 ELKHART NE (SHEET 10)
5 BRISTOL NE (SHEET 12)
6 ELKHART SE (SHEET 17)
7 BRISTOL SW (SHEET 18)
8 BRISTOL SE (SHEET 19)

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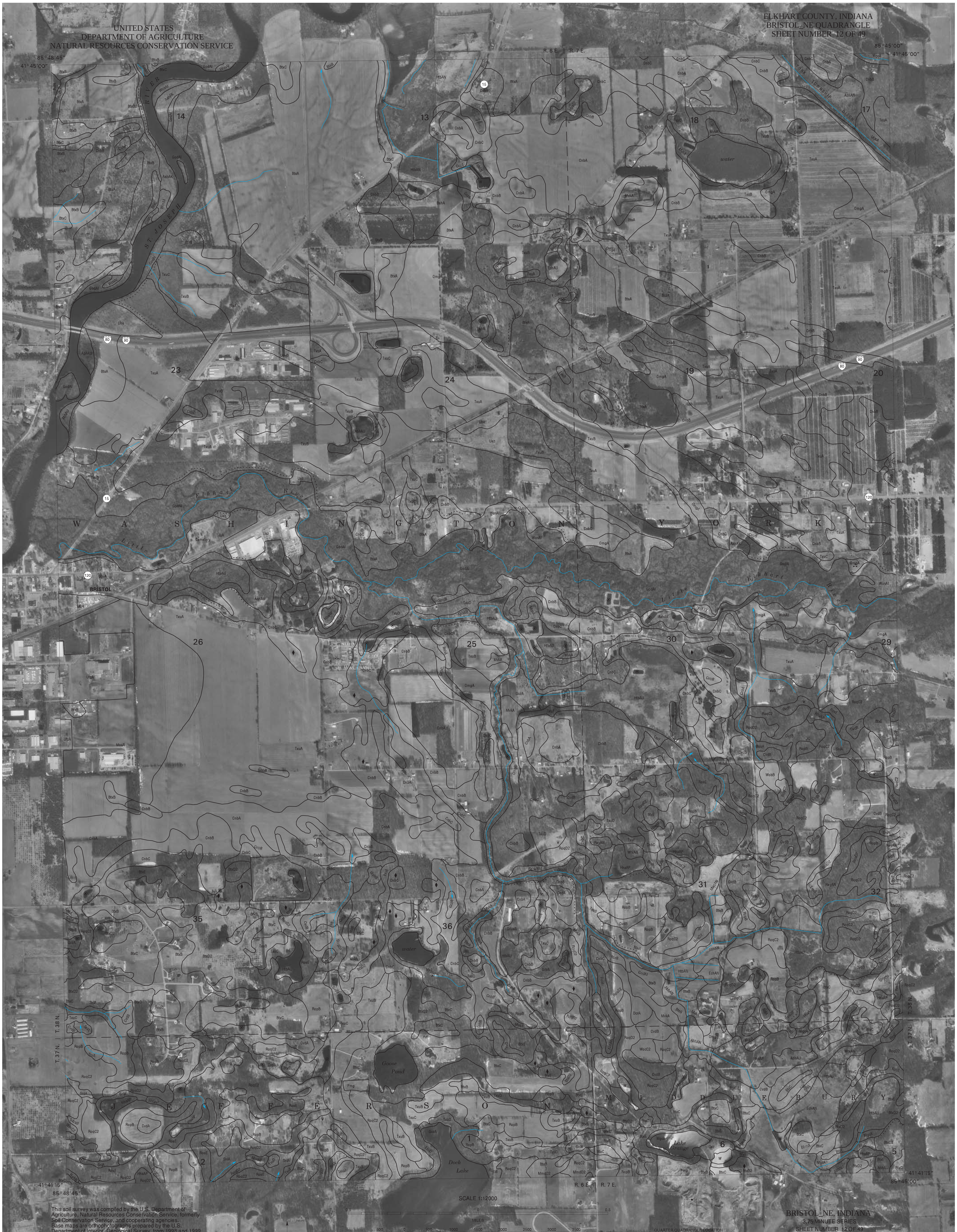

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NORTH

FEET

KILOMETERS

1	2	3
4		5
6	7	8

1 MOTTVILLE SW (SHEET 4)
2 MOTTVILLE SE (SHEET 5)
3 CONSTANTINE SW (SHEET 6)
4 BRISTOL NW (SHEET 11)
5 MIDDLEBURY NW (SHEET 13)
6 BRISTOL SW (SHEET 18)
7 BRISTOL SE (SHEET 19)
8 MIDDLEBURY SW (SHEET 20)

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NORTH

500 0 500 1000 1500 2000 2500 3000 3500
FEET

0.5 0 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 MOTTVILLE SE (SHEET 5)
2 CONSTANTINE SW (SHEET 6)
3 CONSTANTINE SE (SHEET 7)
4 BRISTOL NE (SHEET 12)
5 MIDDLEBURY NE (SHEET 14)
6 BRISTOL SE (SHEET 19)
7 MIDDLEBURY SW (LAGRANGE COUNTY, IN)
8 MIDDLEBURY SE (SHEET 21)

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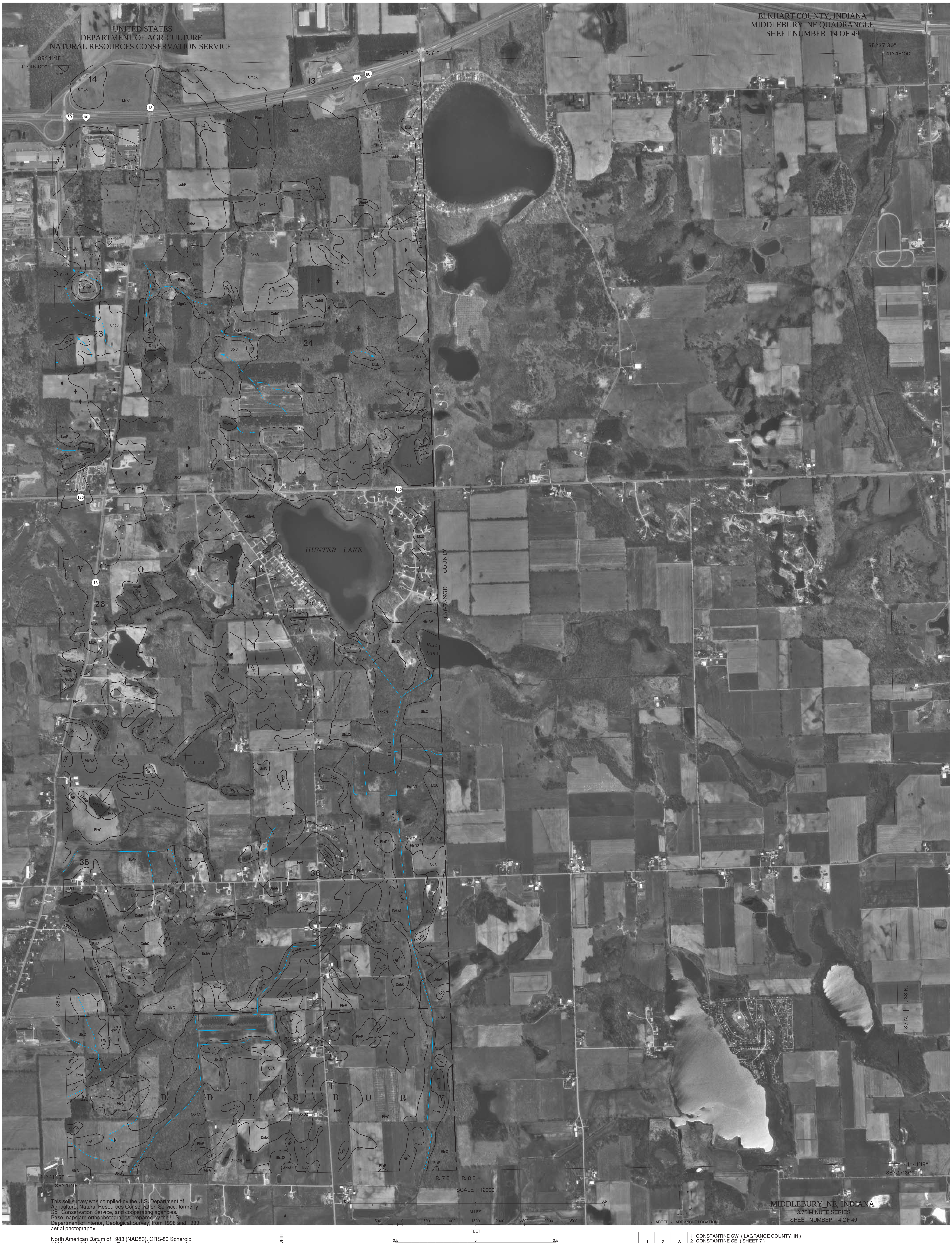

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NORTH

KILOMETERS

1	2	3
4		5
6	7	8

1 CONSTANTINE SW (LAGRANGE COUNTY, IN)
2 CONSTANTINE SE (SHEET 7)
3 KLINGER LAKE SW (LAGRANGE COUNTY, IN)
4 MIDDLEBURY NW (LAGRANGE COUNTY, IN)
5 SHIPSHEWANA NW (LAGRANGE COUNTY, IN)
6 MIDDLEBURY SW (SHEET 20)
7 MIDDLEBURY SE (SHEET 21)
8 SHIPSHEWANA SW (LAGRANGE COUNTY, IN)

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NORTH

FEET

KILOMETERS

1	2	3
4		5
6	7	8

1 OSCEOLA_NW (ST. JOSEPH COUNTY, IN)
2 OSCEOLA_NE (SHEET 8)
3 ELKHART_NW (SHEET 9)
4 OSCEOLA_SW (ST. JOSEPH COUNTY, IN)
5 ELKHART_SW (SHEET 16)
6 WAKARUSA_NW (ST. JOSEPH COUNTY, IN)
7 WAKARUSA_NE (SHEET 22)
8 FORAKER_NW (ST. JOSEPH COUNTY, IN)

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1	2	3
4		5
6	7	8

1 OSCEOLA NE (SHEET 8)
2 ELKHART NW (SHEET 9)
3 ELKHART NE (SHEET 10)
4 OSCEOLA SE (SHEET 15)
5 ELKHART SE (SHEET 17)
6 WAKARUSA NE (SHEET 22)
7 FORAKER NW (SHEET 23)
8 FORAKER NE (SHEET 24)

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1	2	3
4		5
6	7	8

1 ELKHART NW (SHEET 9)
2 ELKHART NE (SHEET 10)
3 BRISTOL NW (SHEET 11)
4 ELKHART SW (SHEET 16)
5 BRISTOL SW (SHEET 18)
6 FORAKER NW (SHEET 23)
7 FORAKER NE (SHEET 24)
8 GOSHEN NW (SHEET 25)

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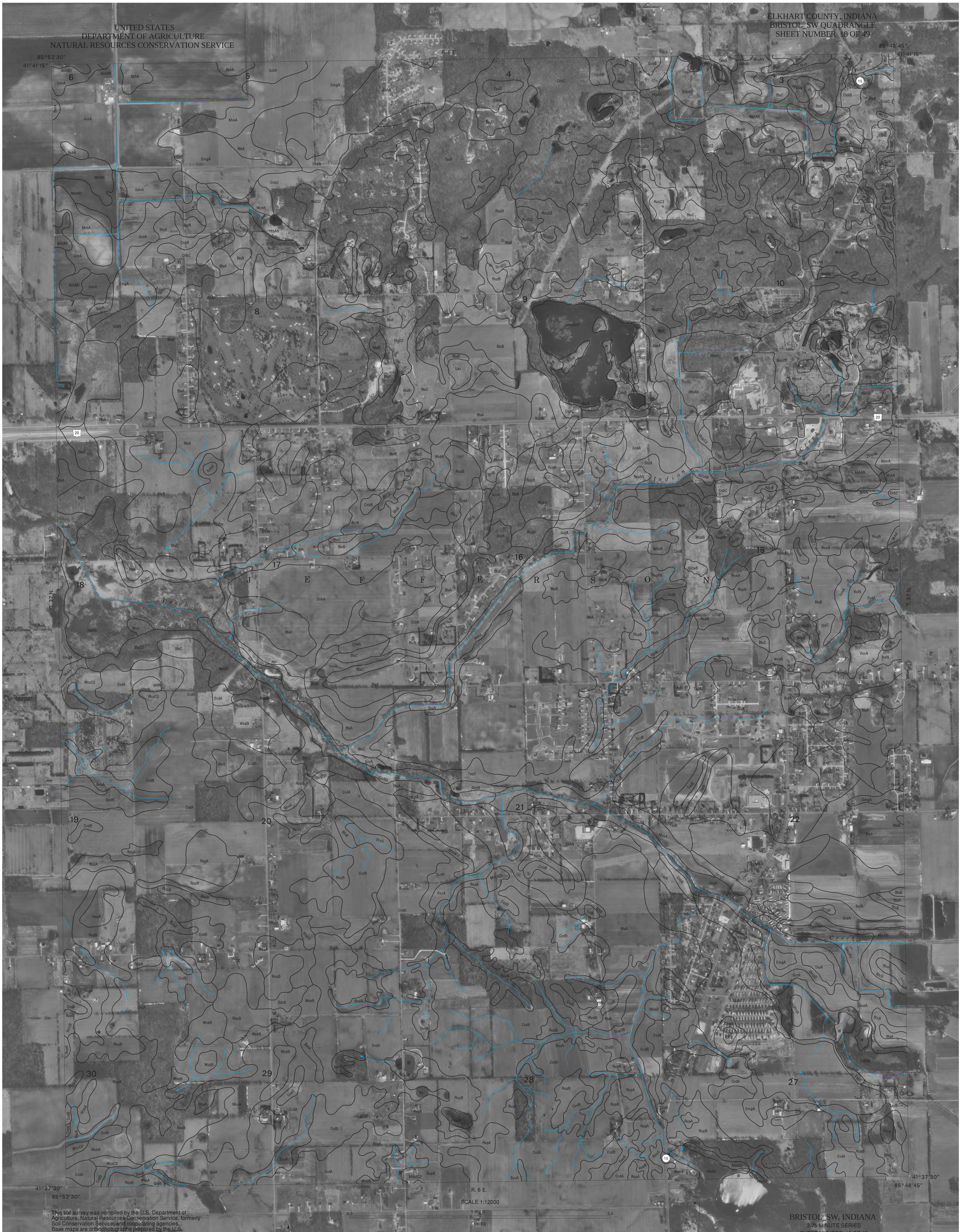

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NORTH

KILOMETERS

1	2	3
4		5
6	7	8

1 ELKHART NE (SHEET 10)
2 BRISTOL NW (SHEET 11)
3 BRISTOL NE (SHEET 12)
4 ELKHART SE (SHEET 17)
5 BRISTOL SE (SHEET 19)
6 FORAKER NE (SHEET 23)
7 GOSHEN NW (SHEET 25)
8 GOSHEN NE (SHEET 26)

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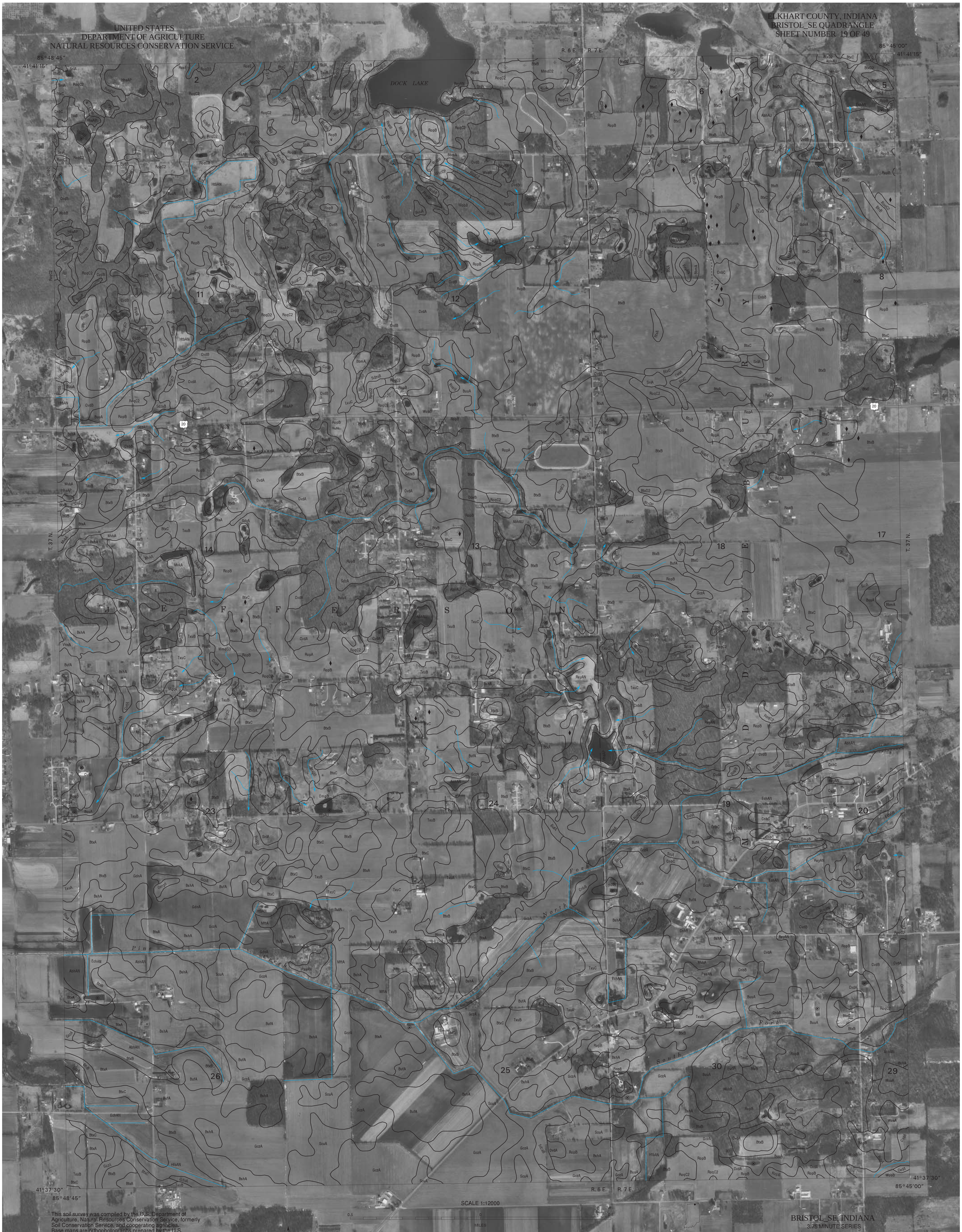

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NORTH

SCALE 1:12000

0.5 0 0.5
MILES

500 0 500 1000 1500 2000 2500 3000 3500
FEET

0.5 0 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 BRISTOL NW (SHEET 11)
2 BRISTOL NE (SHEET 12)
3 MIDDLEBURY NW (SHEET 13)
4 BRISTOL SW (SHEET 18)
5 MIDDLEBURY SW (LAGRANGE COUNTY, IN)
6 GOSHEN NW (SHEET 25)
7 GOSHEN NE (SHEET 26)
8 MILLERSBURG NW (LAGRANGE COUNTY, IN)

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NORTH

FEET

0.5 0 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 BRISTOL NE (SHEET 12)
2 MIDDLEBURY NW (SHEET 13)
3 MIDDLEBURY NE (SHEET 14)
4 BRISTOL SE (SHEET 19)
5 MIDDLEBURY SE (SHEET 21)
6 GOSHEN NE (SHEET 26)
7 MILLERSBURG NW (SHEET 13)
8 MILLERSBURG NE (SHEET 14)

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1	2	3
4		5
6	7	8

1 MIDDLEBURY NW (SHEET 13)
2 MIDDLEBURY NE (SHEET 14)
3 SHIPSHEWANA NW (LAGRANGE COUNTY, IN)
4 MIDDLEBURY SW (SHEET 20)
5 SHIPSHEWANA SW (LAGRANGE COUNTY, IN)
6 MILLERSBURG NW (LAGRANGE COUNTY, IN)
7 MILLERSBURG NE (SHEET 14)
8 TOPEKA NW (LAGRANGE COUNTY, IN)

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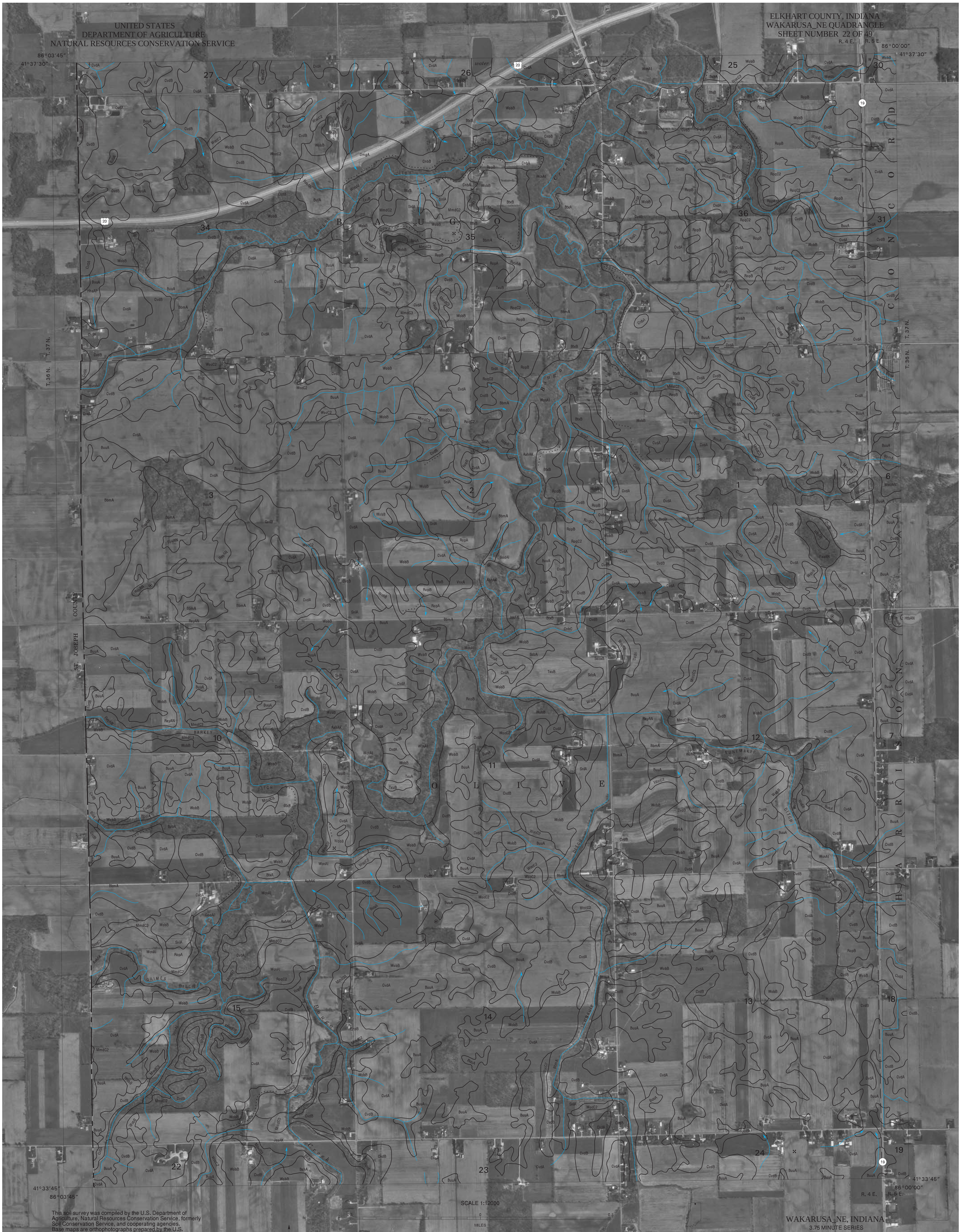

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NORTH

FEET

KILOMETERS

1	2	3
4		5
6	7	8

1 OSCEOLA SW (ST. JOSEPH COUNTY, IN)
2 OSCEOLA SE (SHEET 15)
3 ELKHART SW (SHEET 16)
4 WAKARUSA NW (ST. JOSEPH COUNTY, IN)
5 FORAKER NW (SHEET 23)
6 WAKARUSA SW (ST. JOSEPH COUNTY, IN)
7 WAKARUSA SE (SHEET 29)
8 FORAKER SW (SHEET 30)

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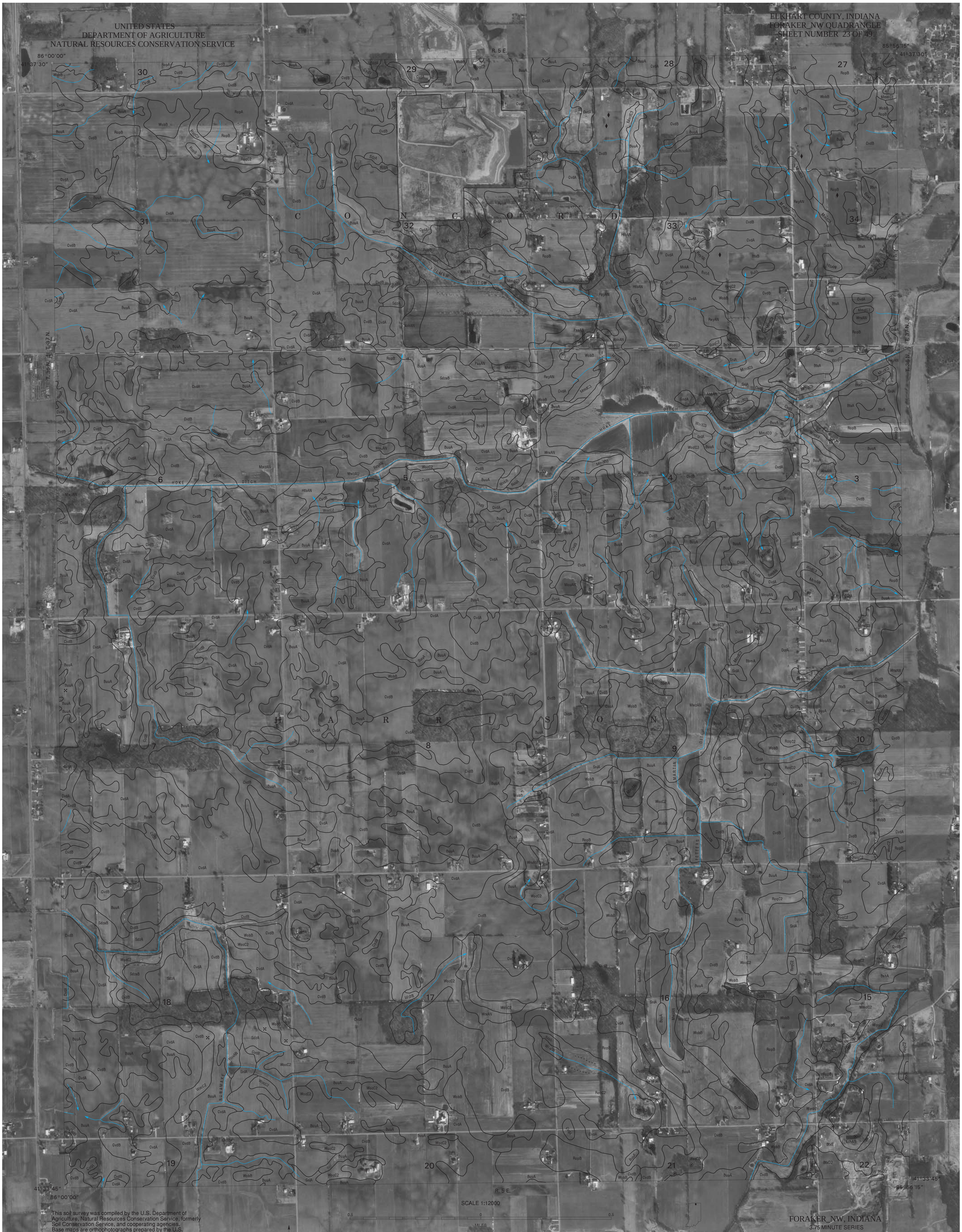

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NORTH

500 0 500 1000 1500 2000 2500 3000 3500

FEET

0.5 0 0.5

KILOMETERS

1	2	3
4		5
6	7	8

1 OSCEOLA SE (SHEET 15)
2 ELKHART SW (SHEET 16)
3 ELKHART SE (SHEET 17)
4 WAKARUSA NE (SHEET 22)
5 FORAKER NE (SHEET 24)
6 WAKARUSA SE (SHEET 29)
7 FORAKER SW (SHEET 30)
8 FORAKER SE (SHEET 31)

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NORTH

500 0 500 1000 1500 2000 2500 3000 3500

FEET

0.5 0 0.5

KILOMETERS

1	2	3
4		5
6	7	8

1 ELKHART SW (SHEET 16)
2 ELKHART SE (SHEET 17)
3 BRISTOL SW (SHEET 18)
4 FORAKER NW (SHEET 23)
5 GOSHEN NW (SHEET 25)
6 FORAKER SW (SHEET 30)
7 FORAKER SE (SHEET 31)
8 GOSHEN SW (SHEET 32)

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UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

ELKHART COUNTY, INDIANA
GOSHEN_NW QUADRANGLE
SHEET NUMBER 25 OF 49

GOSHEN_NW, INDIANA
3.75 MINUTE SERIES
SHEET NUMBER 25 OF 49

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NORTH

0.5 0 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 ELKHART SE (SHEET 17)
2 BRISTOL SW (SHEET 18)
3 BRISTOL SE (SHEET 19)
4 FORAKER NE (SHEET 24)
5 GOSHEN NE (SHEET 26)
6 FORAKER SE (SHEET 31)
7 GOSHEN SW (SHEET 32)
8 GOSHEN SE (SHEET 33)

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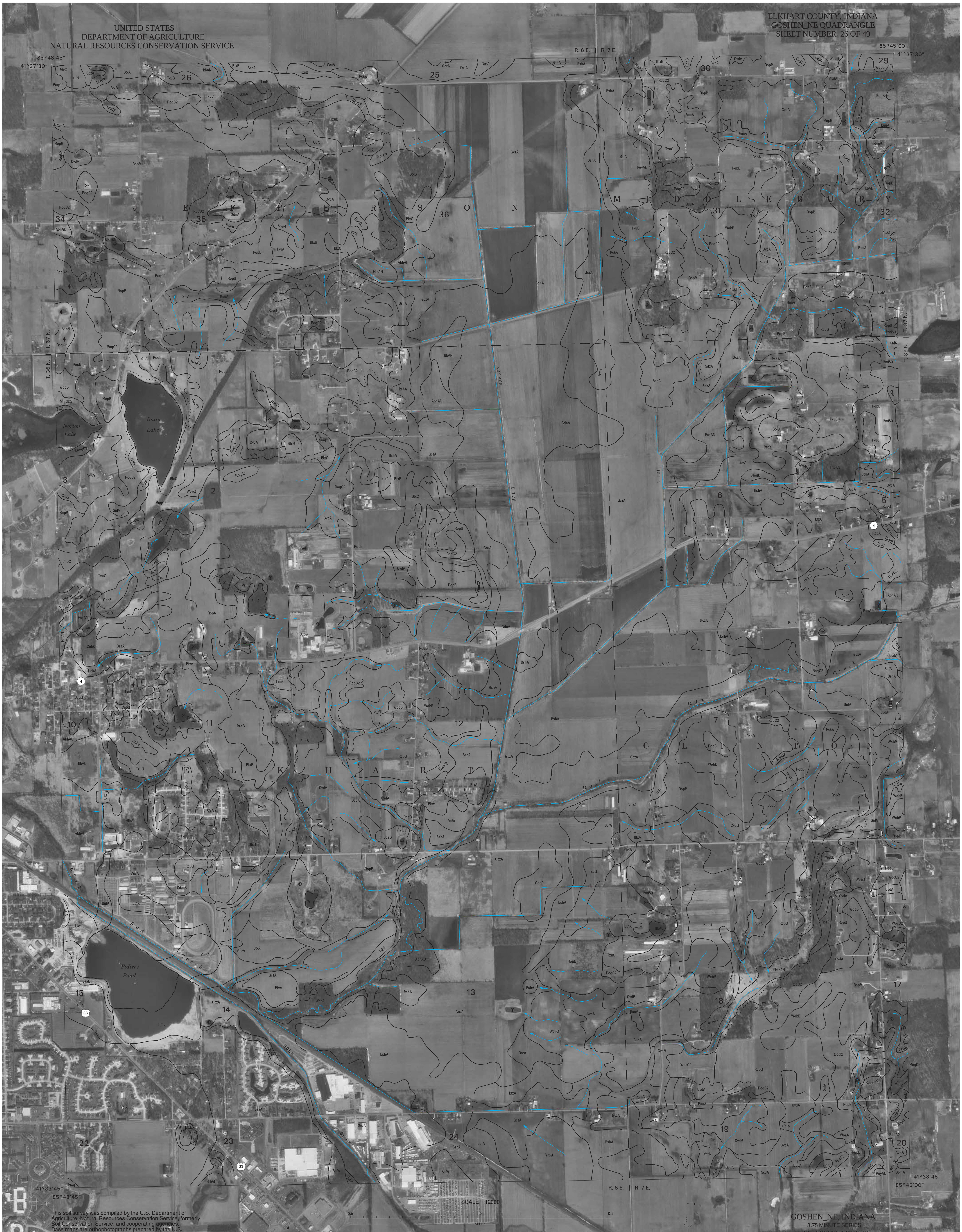

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NORTH

FEET

KILOMETERS

1	2	3
4		5
6	7	8

1 BRISTOL SW (SHEET 32)
2 BRISTOL SE (SHEET 33)
3 MIDDLEBURY SW (SHEET 34)
4 GOSHEN NW (SHEET 25)
5 MILLERSBURG NW (SHEET 27)
6 GOSHEN SW (SHEET 18)
7 GOSHEN SE (SHEET 19)
8 MILLERSBURG SW (SHEET 20)

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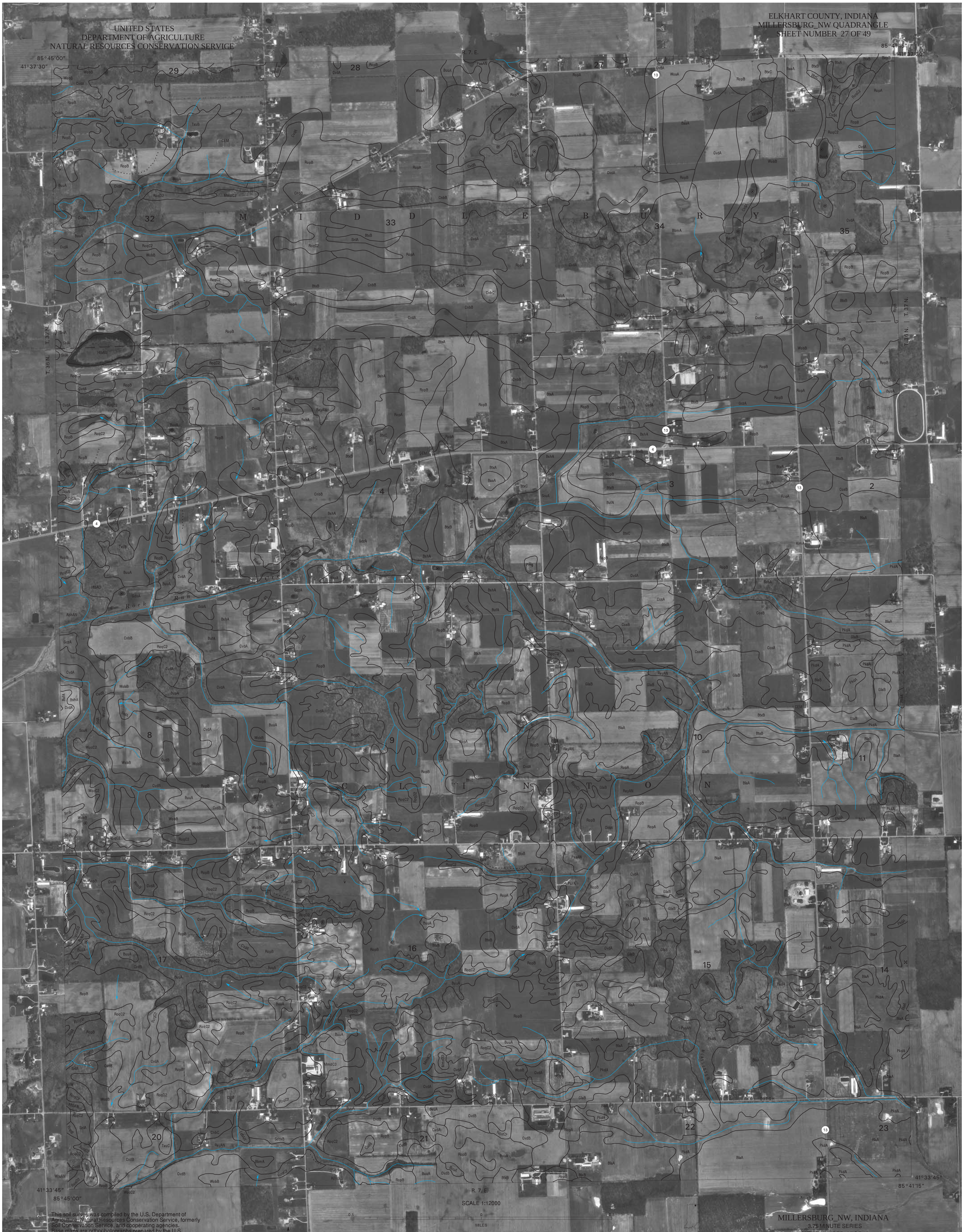

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NORTH

FEET

KILOMETERS

1	2	3
4		5
6	7	8

1 BRISTOL SE (SHEET 33)
2 MIDDLEBURY SW (SHEET 34)
3 MIDDLEBURY SE (SHEET 35)
4 GOSHEN NE (SHEET 26)
5 MILLERSBURG NE (SHEET 28)
6 GOSHEN SE (SHEET 19)
7 MILLERSBURG SW (SHEET 20)
8 MILLERSBURG SE (SHEET 21)

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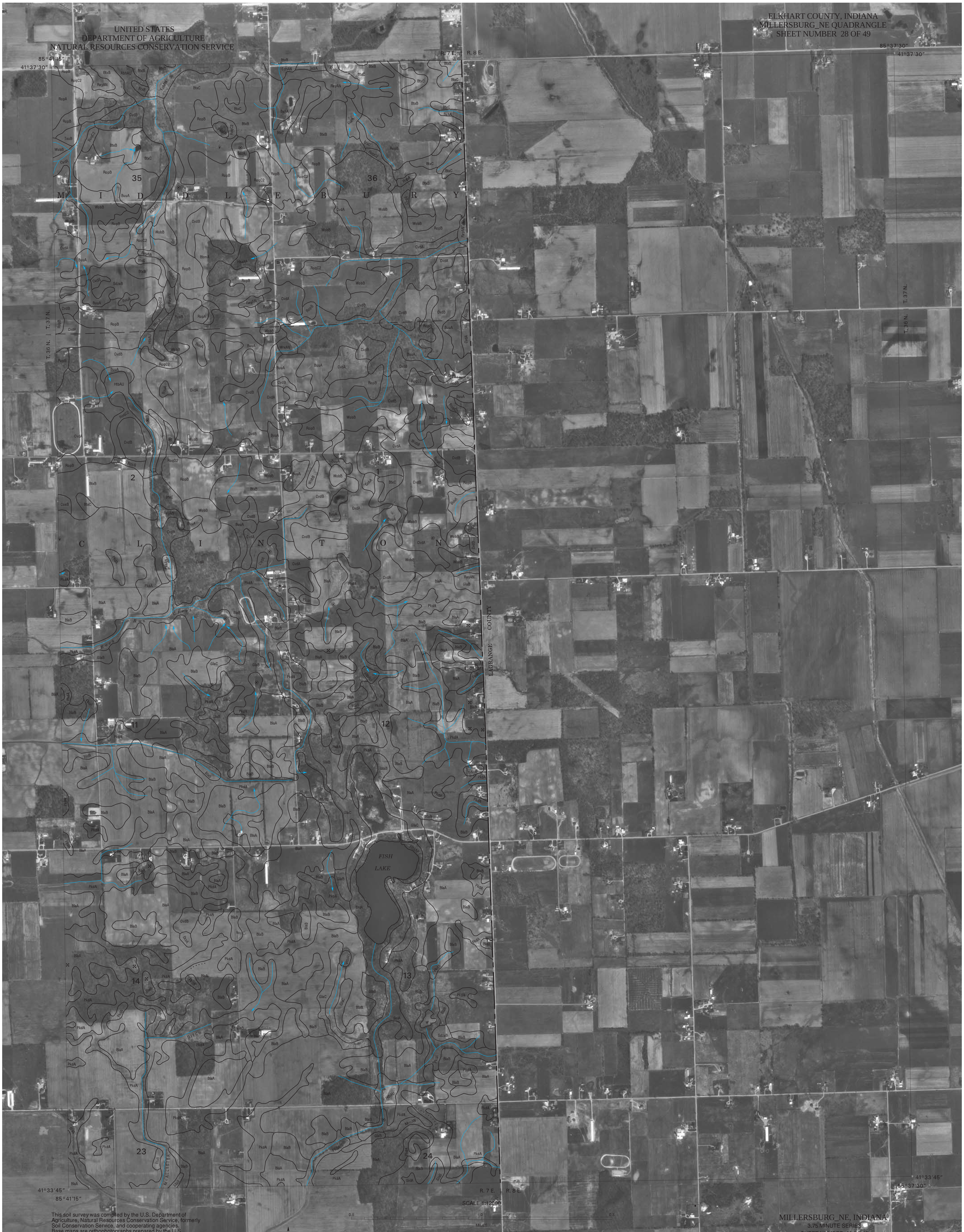
UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE



MILLERSBURG_NE, INDIANA
3.75 MINUTE SERIES
SHEET NUMBER 28 OF 49

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey, from 1998 and 1999 aerial photography.

North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 16. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

1 MIDDLEBURY SW (SHEET 20)
2 MIDDLEBURY SE (SHEET 21)
3 SHIPSHEWANA SW (LAGRANGE COUNTY, IN)
4 MILLERSBURG NW (SHEET 27)
5 TOPEKA NW (LAGRANGE COUNTY, IN)
6 MILLERSBURG SW (SHEET 34)
7 MILLERSBURG SE (SHEET 35)
8 TOPEKA SW (LAGRANGE COUNTY, IN)

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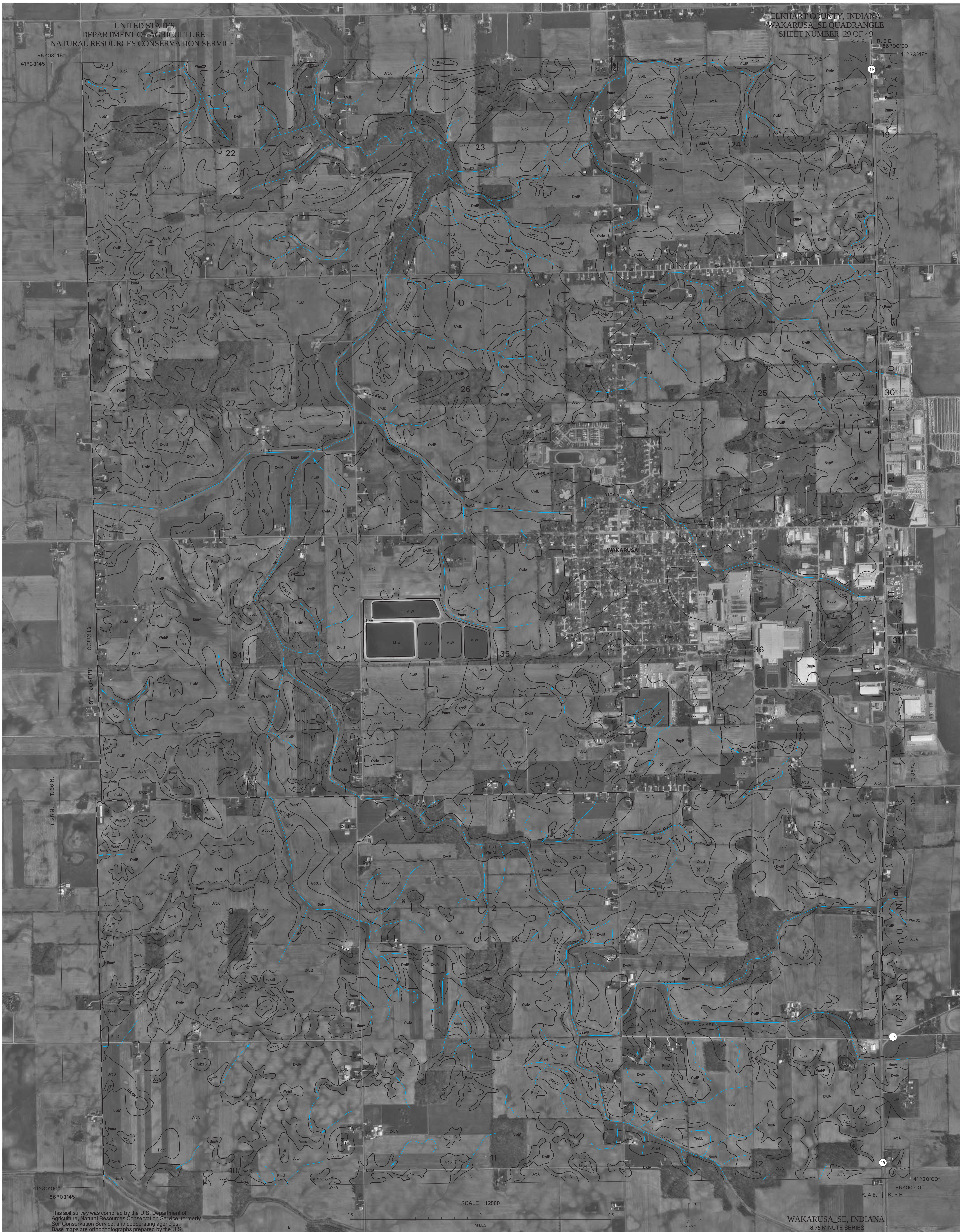
UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

ELKHART COUNTY, INDIANA
WAKARUSA_SE QUADRANGLE
SHEET NUMBER 29 OF 49



WAKARUSA_SE, INDIANA
3.75 MINUTE SERIES
SHEET NUMBER 29 OF 49

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North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 16. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

1	2	3
4		5
6	7	8

1 WAKARUSA NW (ST. JOSEPH COUNTY, IN)
2 WAKARUSA NE (SHEET 22)
3 FORAKER NW (SHEET 23)
4 WAKARUSA SW (ST. JOSEPH COUNTY, IN)
5 FORAKER SW (SHEET 30)
6 NAPPANEE WEST NW (KOSCIUSKO AND MARSHALL COUNTY, IN)
7 NAPPANEE WEST NE (SHEET 36)
8 NAPPANEE EAST NW (SHEET 37)

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North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 16. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

KILOMETERS

1	2	3
4		5
6	7	8

1 WAKARUSA NE (SHEET 22)
2 FORAKER NW (SHEET 23)
3 FORAKER NE (SHEET 24)
4 WAKARUSA SE (SHEET 29)
5 FORAKER SE (SHEET 31)
6 NAPPANEE WEST NE (SHEET 36)
7 NAPPANEE EAST NW (SHEET 37)
8 NAPPANEE EAST NE (SHEET 38)

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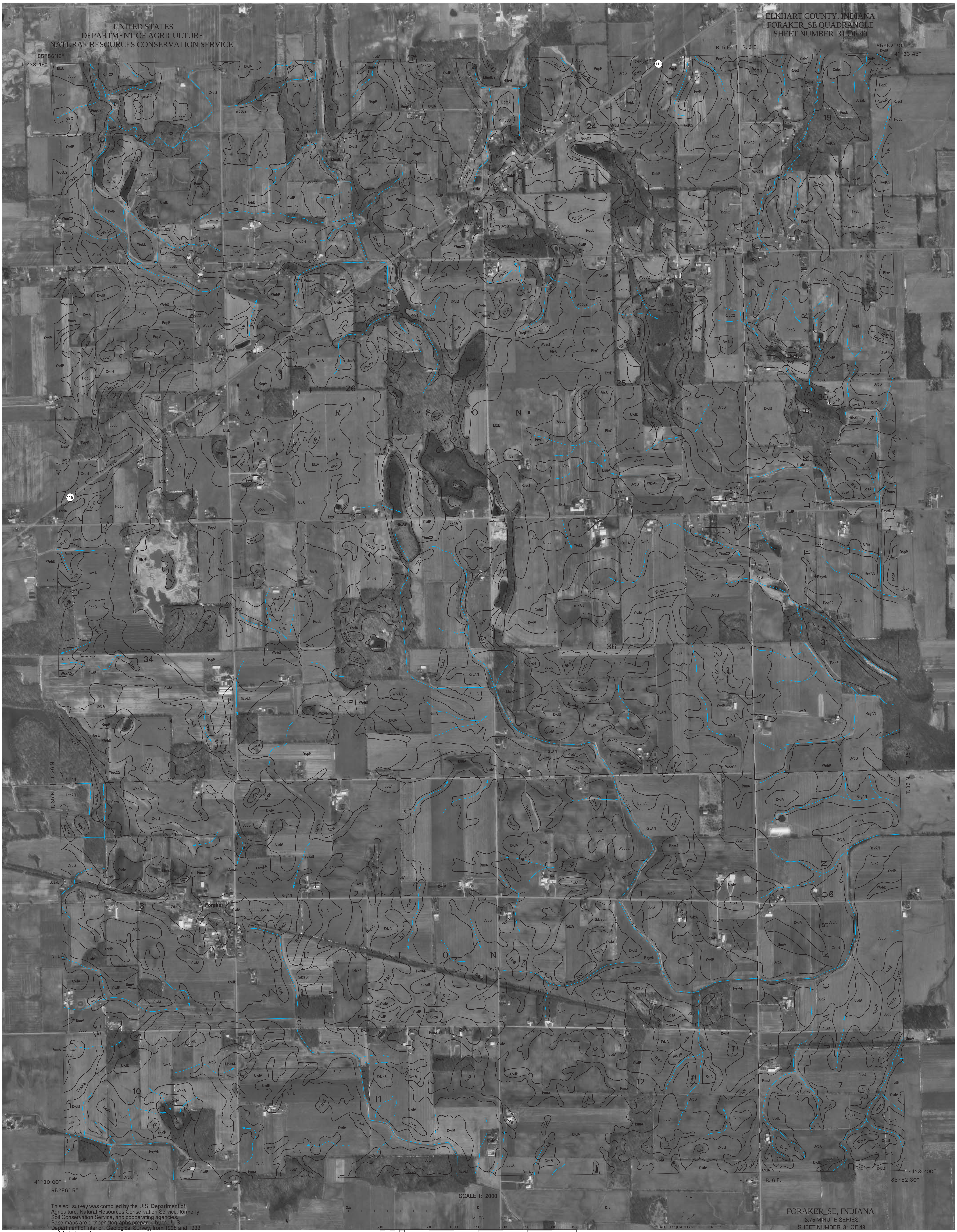

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North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 16. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

KILOMETERS

1	2	3
4		5
6	7	8

1 FORAKER NW (SHEET 23)
2 FORAKER NE (SHEET 24)
3 GOSHEN NW (SHEET 25)
4 FORAKER SW (SHEET 30)
5 GOSHEN SW (SHEET 32)
6 NAPPANEE EAST NW (SHEET 37)
7 NAPPANEE EAST NE (SHEET 38)
8 MILFORD NW (SHEET 39)

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North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 16. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

FEET

KILOMETERS

1	2	3
4		5
6	7	8

1 FORAKER NE (SHEET 24)
2 GOSHEN NW (SHEET 25)
3 GOSHEN NE (SHEET 26)
4 FORAKER SE (SHEET 31)
5 GOSHEN SE (SHEET 33)
6 NAPPANEE EAST NE (SHEET 38)
7 MILFORD NW (SHEET 39)
8 MIFORD NE (SHEET 40)

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North American Datum of 1983 (NAD83). GRS-80 Spheroid
1000-meter ticks: Universal Transverse Mercator, zone 16.
Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

FEET

KILOMETERS

1	2	3
4		5
6	7	8

1 GOSHEN NW (SHEET 25)
2 GOSHEN NE (SHEET 26)
3 MILLERSBURG NW (SHEET 27)
4 GOSHEN SW (SHEET 32)
5 MILLERSBURG NE (SHEET 34)
6 MILFORD NW (SHEET 39)
7 MILFORD NE (SHEET 40)
8 LAKE WAWASEE NW (SHEET 41)

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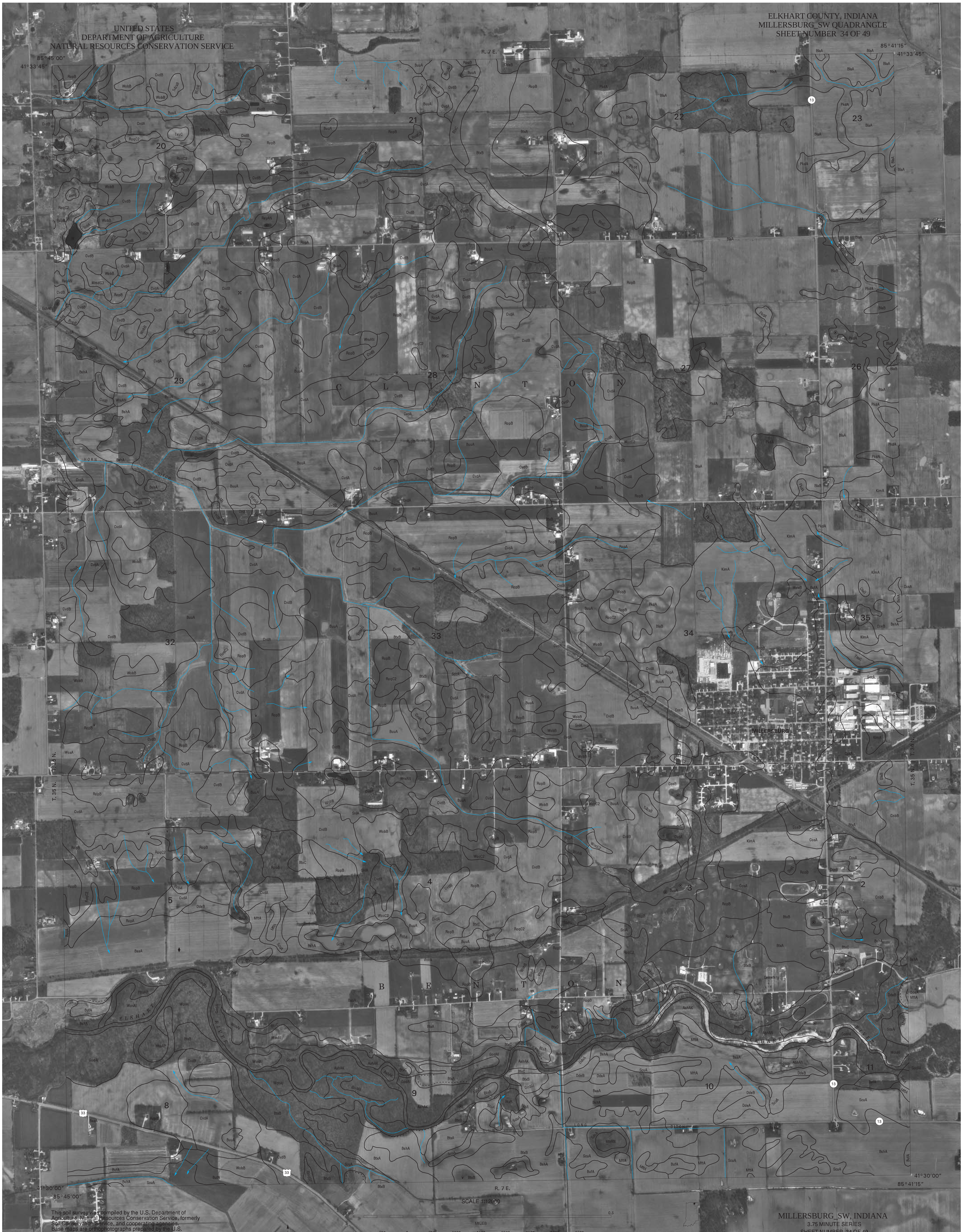
UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

ELKHART COUNTY, INDIANA
MILLERSBURG_SW QUADRANGLE
SHEET NUMBER 34 OF 49



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North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 16. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

FEET

KILOMETERS

MILLERSBURG_SW, INDIANA
3.75 MINUTE SERIES
SHEET NUMBER 34 OF 49

QUARTER QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

1 GOSHEN NE (SHEET 26)
2 MILLERSBURG NW (SHEET 27)
3 MILLERSBURG NE (SHEET 28)
4 GOSHEN SE (SHEET 33)
5 MILLERSBURG SE (SHEET 35)
6 MILFORD NE (SHEET 40)
7 LAKE WAWASEE NW (SHEET 41)
8 LAKE WAWASEE NE (SHEET 42)

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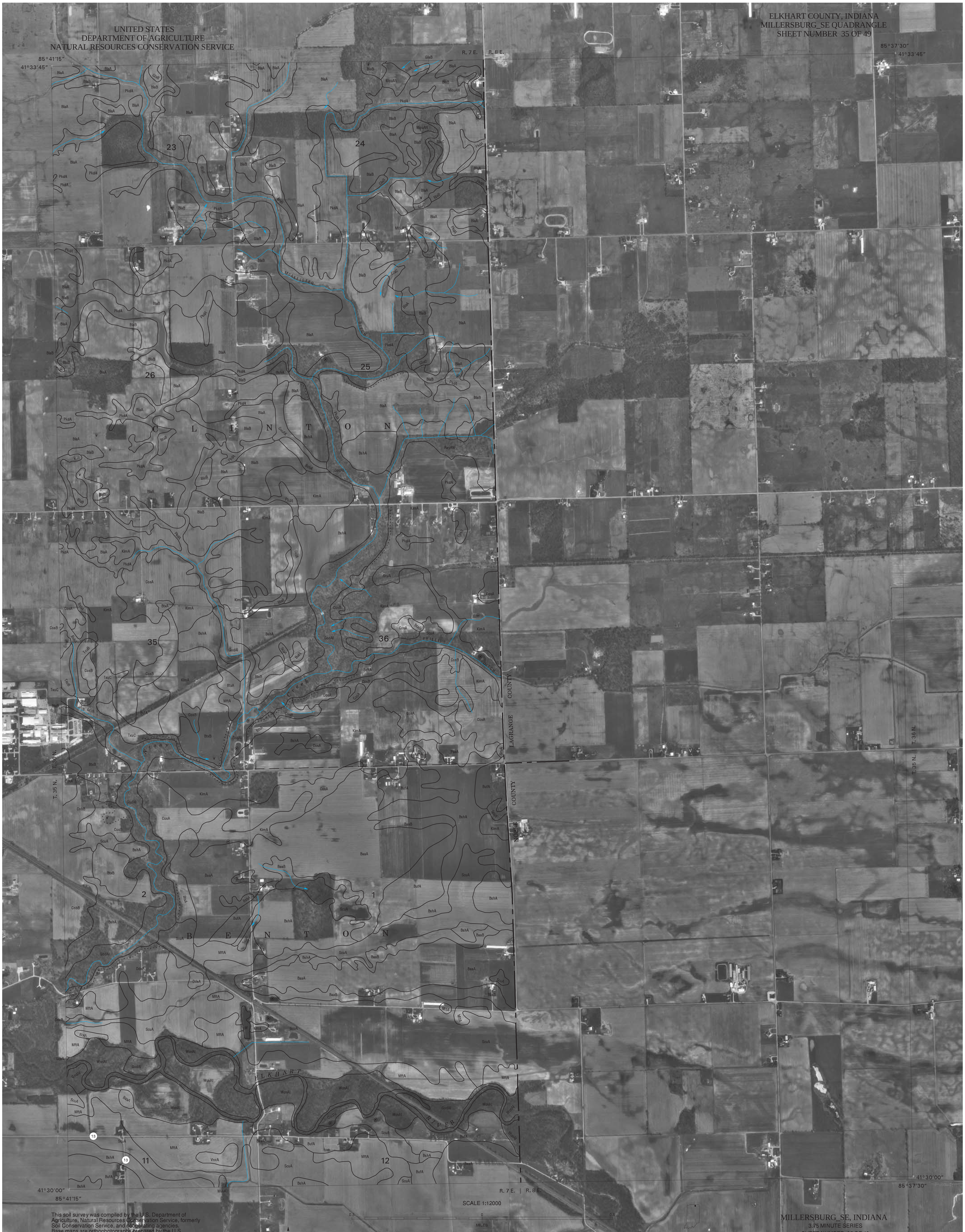

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North American Datum of 1983 (NAD83). GRS-80 Spheroid
1000-meter ticks: Universal Transverse Mercator, zone 16.
Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

FEET

0.5 0 0.5

KILOMETERS

1	2	3
4		5
6	7	8

1 MILLERSBURG NW (SHEET 41)
2 MILLERSBURG NE (SHEET 42)
3 TOPEKA NW (LAGRANGE COUNTY, IN)
4 MILLERSBURG SW (SHEET 34)
5 TOPEKA SW (LAGRANGE AND NOBLE COUNTY, IN)
6 LAKE WAWASEE NW (SHEET 27)
7 LAKE WAWASEE NE (SHEET 28)
8 LIGONIER NW (LAGRANGE AND NOBLE COUNTY, IN)

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1000-meter ticks: Universal Transverse Mercator, zone 16.
Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

1	2	3
4		5
6	7	8

1 WAKARUSA SW (ST. JOSEPH COUNTY, IN)
2 WAKARUSA SE (SHEET 29)
3 FORAKER SW (SHEET 30)
4 NAPPANEE WEST NW (MARSHALL AND ST. JOSEPH COUNTY, IN)
5 NAPPANEE EAST NW (SHEET 37)
6 NAPPANEE WEST SW (MARSHALL COUNTY, IN)
7 NAPPANEE WEST SE (SHEET 43)
8 NAPPANEE EAST SW (SHEET 44)

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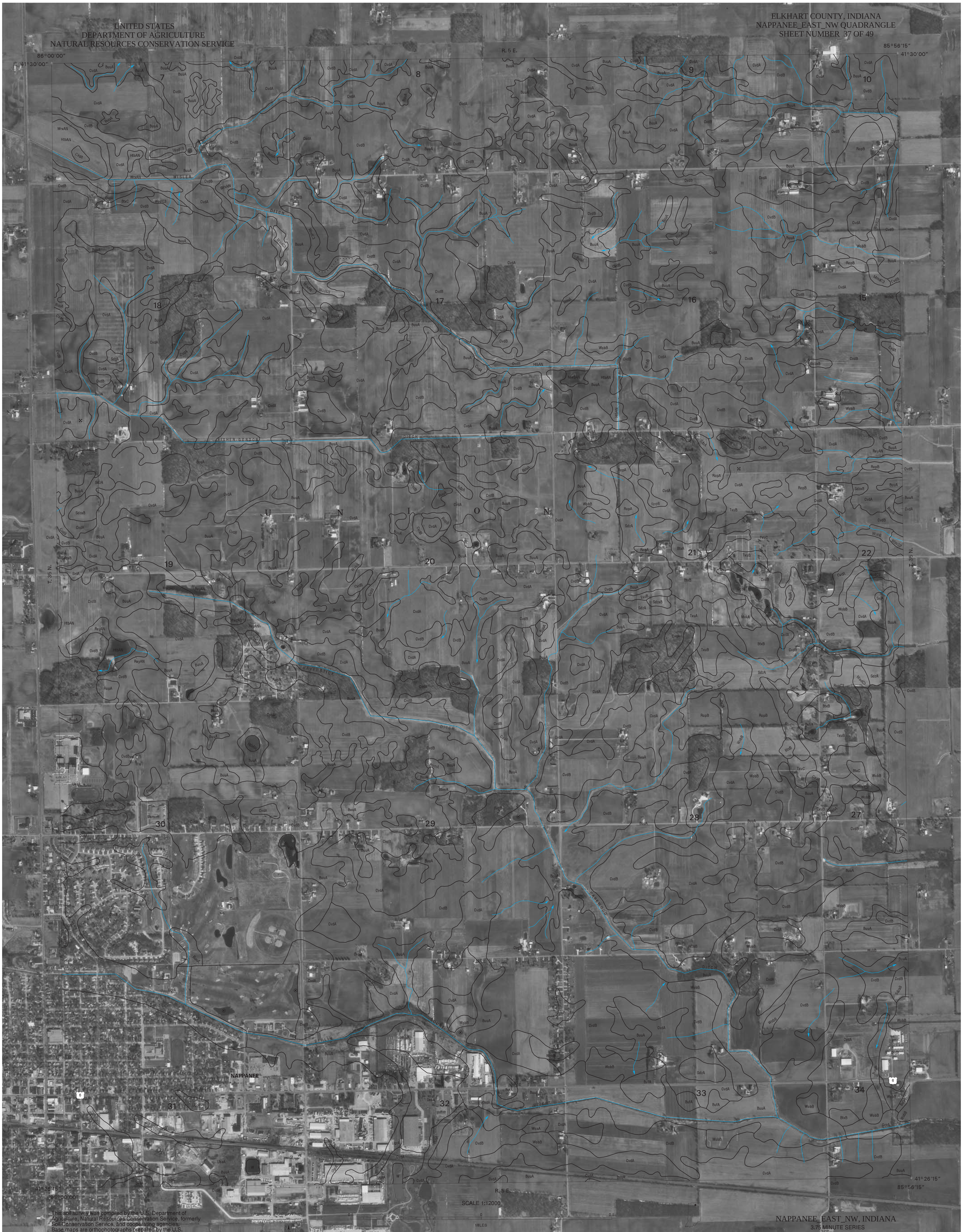

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NORTH

500 0 500 1000 1500 2000 2500 3000 3500

FEET

0.5 0 0.5

KILOMETERS

1	2	3
4		5
6	7	8

1 WAKARUSA SE (SHEET 29)
2 FORAKER SW (SHEET 30)
3 FORAKER SE (SHEET 31)
4 NAPPANEE WEST NE (SHEET 36)
5 NAPPANEE EAST NE (SHEET 38)
6 NAPPANEE WEST SE (SHEET 43)
7 NAPPANEE EAST SW (SHEET 44)
8 NAPPANEE EAST SE (SHEET 45)

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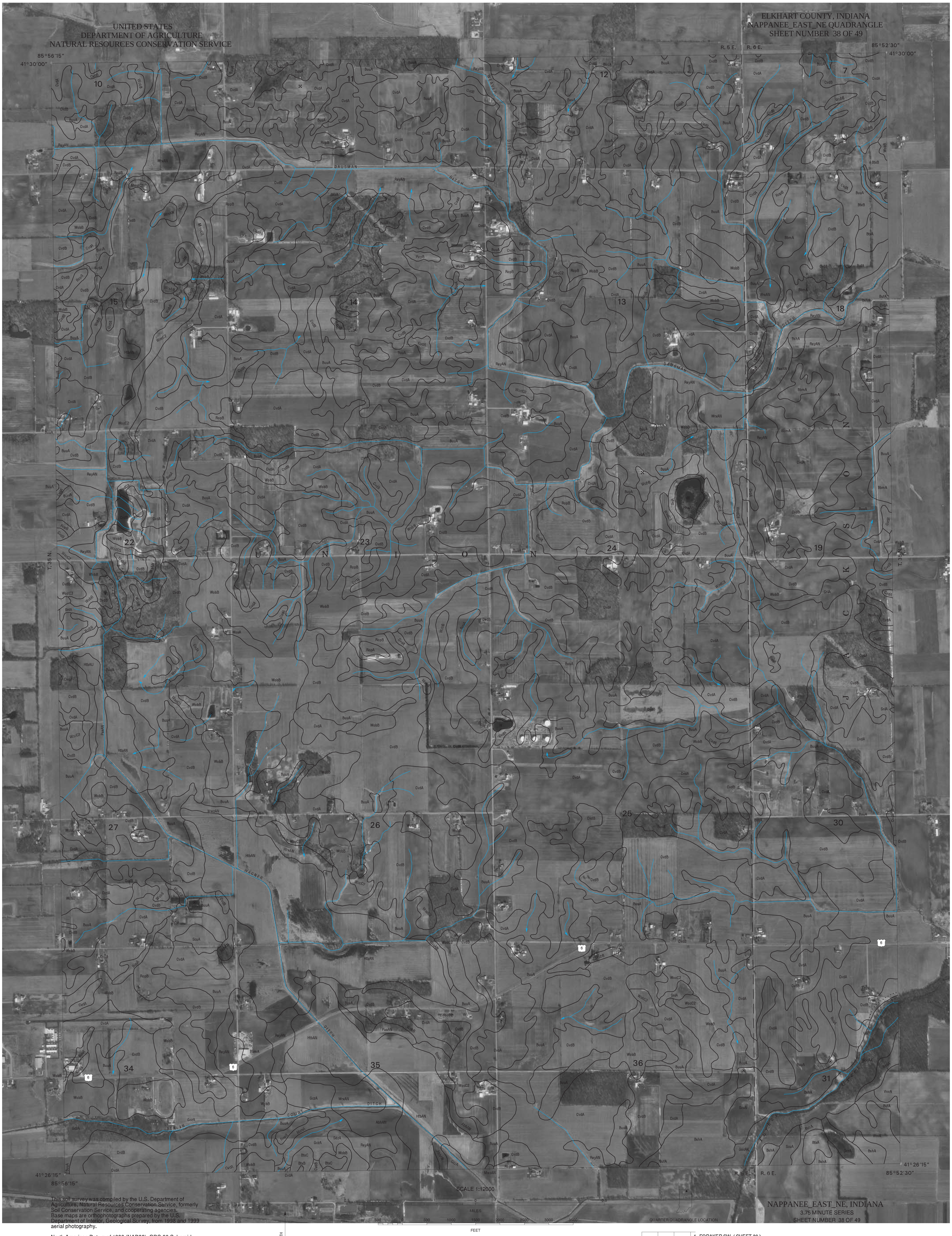

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North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 16. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

FEET

KILOMETERS

1	2	3
4		5
6	7	8

1 FORAKER SW (SHEET 30)
2 FORAKER SE (SHEET 31)
3 GOSHEN SW (SHEET 32)
4 NAPPANEE EAST NW (SHEET 37)
5 MILFORD NW (SHEET 39)
6 NAPPANEE EAST SW (SHEET 44)
7 NAPPANEE EAST SE (SHEET 45)
8 MILFORD SW (SHEET 46)

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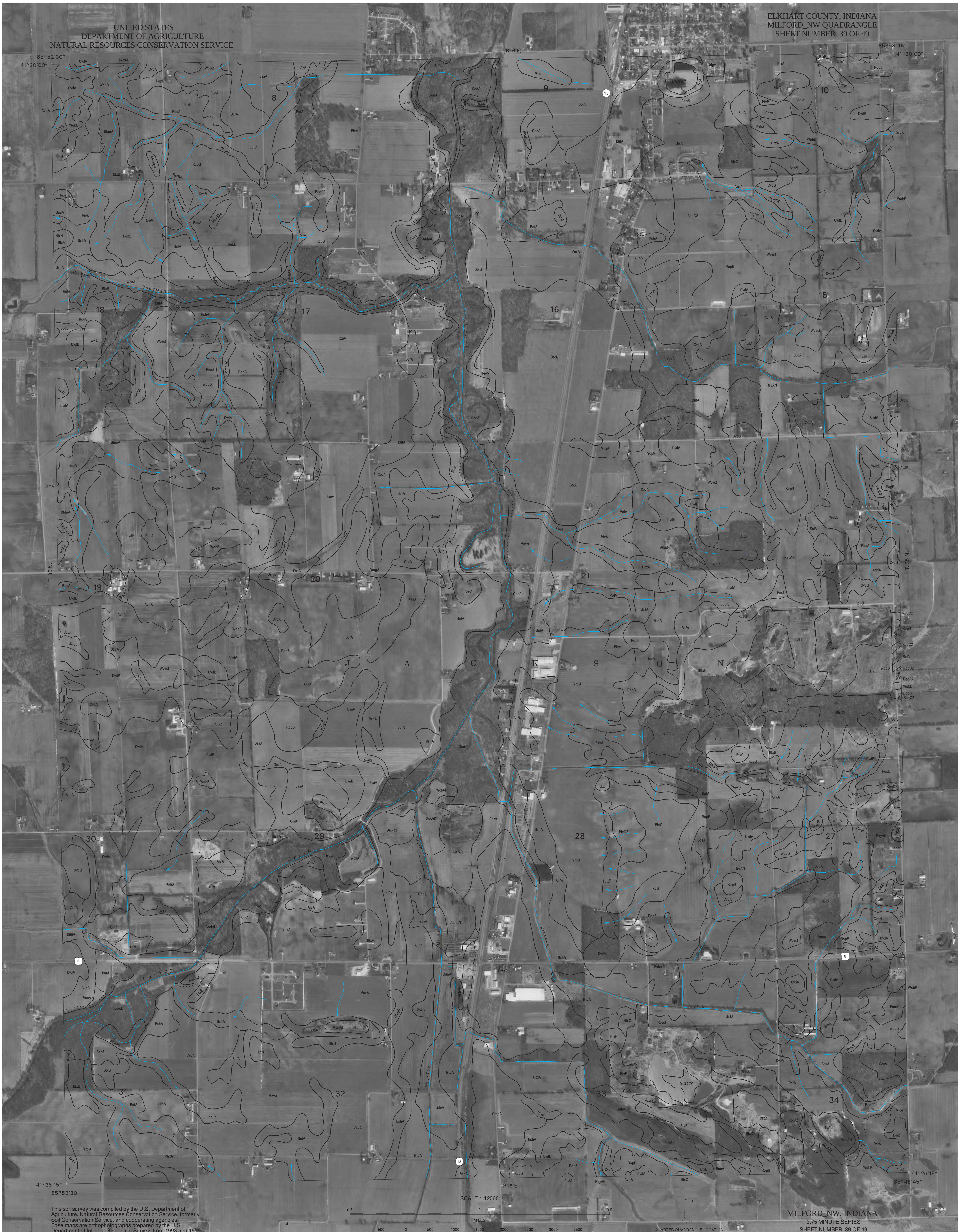

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NORTH

FEET

KILOMETERS

1	2	3
4		5
6	7	8

1 FORAKER SE (SHEET 31)
2 GOSHEN NE (SHEET 32)
3 GOSHEN SE (SHEET 33)
4 NAPPANEE EAST NE (SHEET 38)
5 MILFORD NE (SHEET 40)
6 NAPPANEE EAST SE (SHEET 45)
7 MILFORD SW (SHEET 46)
8 MILFORD SE (SHEET 47)

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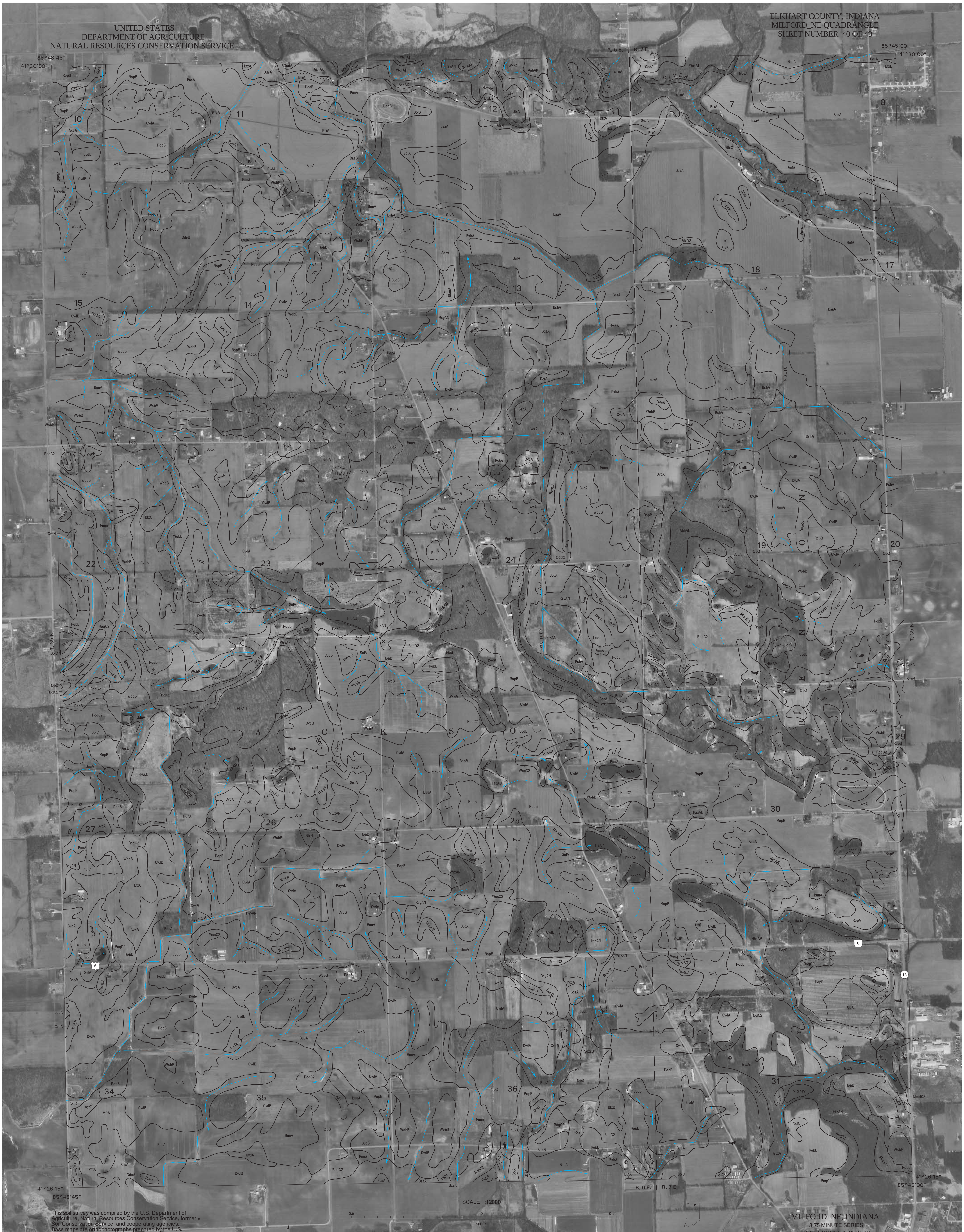

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NORTH

FEET

KILOMETERS

1	2	3
4		5
6	7	8

1 GOSHEN SW (SHEET 32)
2 GOSHEN SE (SHEET 33)
3 MILLERSBURG SW (SHEET 34)
4 MILFORD NW (SHEET 39)
5 LAKE WAWASEE NW (SHEET 41)
6 MILFORD SW (SHEET 46)
7 MILFORD SE (SHEET 47)
8 LAKE WAWASEE SW (SHEET 48)

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North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 16. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

0.5 0 0.5

KILOMETERS

1	2	3
4		5
6	7	8

1 GOSHEN SE (SHEET 33)
2 MILLERSBURG SW (SHEET 34)
3 MILLERSBURG SE (SHEET 35)
4 MILFORD NE (SHEET 40)
5 LAKE WAWASEE NE (SHEET 42)
6 MILFORD SE (SHEET 47)
7 LAKE WAWASEE SW (SHEET 48)
8 LAKE WAWASEE SE (SHEET 49)

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aerial photography.

North American Datum of 1983 (NAD83). GRS-80 Spheroid
1000-meter ticks: Universal Transverse Mercator, zone 16.
Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

FEET

KILOMETERS

1	2	3
4		5
6	7	8

1 MILLERSBURG SW (SHEET 34)
2 MILLERSBURG SE (SHEET 35)
3 TOPEKA SW (LAGRANGE AND NOBLE COUNTY, IN)
4 LAKE WAWASEE NW (SHEET 41)
5 LIGONIER NW (NOBLE COUNTY, IN)
6 LAKE WAWASEE SW (SHEET 48)
7 LAKE WAWASEE NE (SHEET 49)
8 LIGONIER SW (NOBLE COUNTY, IN)

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1	2	3
4		5
6	7	8

1 NAPPANEE WEST NW (ST. JOSEPH AND MARSHALL COUNTY, IN)
2 NAPPANEE WEST NE (SHEET 36)
3 NAPPANEE EAST NW (SHEET 37)
4 NAPPANEE WEST SW (MARSHALL COUNTY, IN)
5 NAPPANEE EAST SW (SHEET 44)
6 BOURBON NW (MARSHALL COUNTY, IN)
7 BOURBON NE (KOSCIUSKO COUNTY, IN)
8 ATWOOD NW (KOSCIUSKO COUNTY, IN)

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NORTH

0.5 0 0.5
MILES

500 0 500 1000 1500 2000 2500 3000 3500
FEET

0.5 0 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 NAPPANEE WEST NE (SHEET 36)
2 NAPPANEE EAST NW (SHEET 37)
3 NAPPANEE EAST NE (SHEET 38)
4 NAPPANEE WEST SE (SHEET 43)
5 NAPPANEE EAST SE (SHEET 45)
6 BOURBON NE (KOSCIUSKO COUNTY, IN)
7 ATWOOD NW (KOSCIUSKO COUNTY, IN)
8 ATWOOD NE (KOSCIUSKO COUNTY, IN)

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NORTH

MILES

FEET

KILOMETERS

1	2	3
4		5
6	7	8

1 NAPPANEE EAST NW (SHEET 37)
2 NAPPANEE EAST NE (SHEET 38)
3 MILFORD NW (SHEET 39)
4 NAPPANEE EAST SW (SHEET 44)
5 MILFORD SW (SHEET 46)
6 ATWWOD NW (KOSCIUSKO COUNTY, IN)
7 ATWOOD NE (KOSCIUSKO COUNTY, IN)
8 LEESBURG NW (KOSCIUSKO COUNTY, IN)

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NORTH

FEET

KILOMETERS

1	2	3
4		5
6	7	8

1 NAPPANEE EAST NE (SHEET 38)
2 MILFORD NW (SHEET 39)
3 MILFORD NE (SHEET 40)
4 NAPPANEE EAST SE (SHEET 45)
5 MILFORD SE (SHEET 47)
6 ATWOOD NE (KOSCIUSKO COUNTY, IN)
7 LEESBURG NW (KOSCIUSKO COUNTY, IN)
8 LEESBURG NE (KOSCIUSKO COUNTY, IN)

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UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

ELKHART COUNTY, INDIANA
MILFORD_SE QUADRANGLE
SHEET NUMBER 47 OF 49

MILFORD_SE, INDIANA
3.75 MINUTE SERIES
SHEET NUMBER 47 OF 49

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1000-meter ticks: Universal Transverse Mercator, zone 16.
Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

FEET

KILOMETERS

1	2	3
4		5
6	7	8

1 MILFORD NW (SHEET 39)
2 MILFORD NE (SHEET 40)
3 LAKE WAWASEE NW (SHEET 41)
4 MILFORD SW (SHEET 46)
5 LAKE WAWASEE SW (SHEET 48)
6 LEESBURG NW (KOSCIUSKO COUNTY, IN)
7 LEESBURG NE (KOSCIUSKO COUNTY, IN)
8 NORTH WEBSTER NW (KOSCIUSKO COUNTY, IN)

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NORTH

SCALE 1:12000

FEET

KILOMETERS

1	2	3
4		5
6	7	8

1 MILFORD NE (SHEET 40)
2 LAKE WAWASEE NW (SHEET 41)
3 LAKE WAWASEE NE (SHEET 42)
4 MILFORD SE (SHEET 47)
5 LAKE WAWASEE SE (SHEET 49)
6 LEESBURG NE (KOSCIUSKO COUNTY, IN)
7 NORTH WEBSTER NW (KOSCIUSKO COUNTY, IN)
8 NORTH WEBSTER NE (NOBLE AND KOSCIUSKO COUNTY, IN)

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NORTH

0.5 0 0.5
MILES

500 0 500 1000 1500 2000 2500 3000 3500
FEET

0.5 0 0.5
KILOMETERS

1	2	3
4		5
6	7	8

1 LAKE_WAWASEE_NW (SHEET 41)
2 LAKE_WAWASEE_NE (SHEET 42)
3 LIGONIER_NW (NOBLE COUNTY, IN)
4 LAKE_WAWASEE_SW (SHEET 48)
5 LIGONIER_SW (NOBLE COUNTY, IN)
6 NORTH_WEBSTER_NW (KOSCIUSKO COUNTY, IN)
7 NORTH_WEBSTER_NE (NOBLE AND KOSCIUSKO COUNTY, IN)
8 ORMAS_NW (NOBLE COUNTY, IN)

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